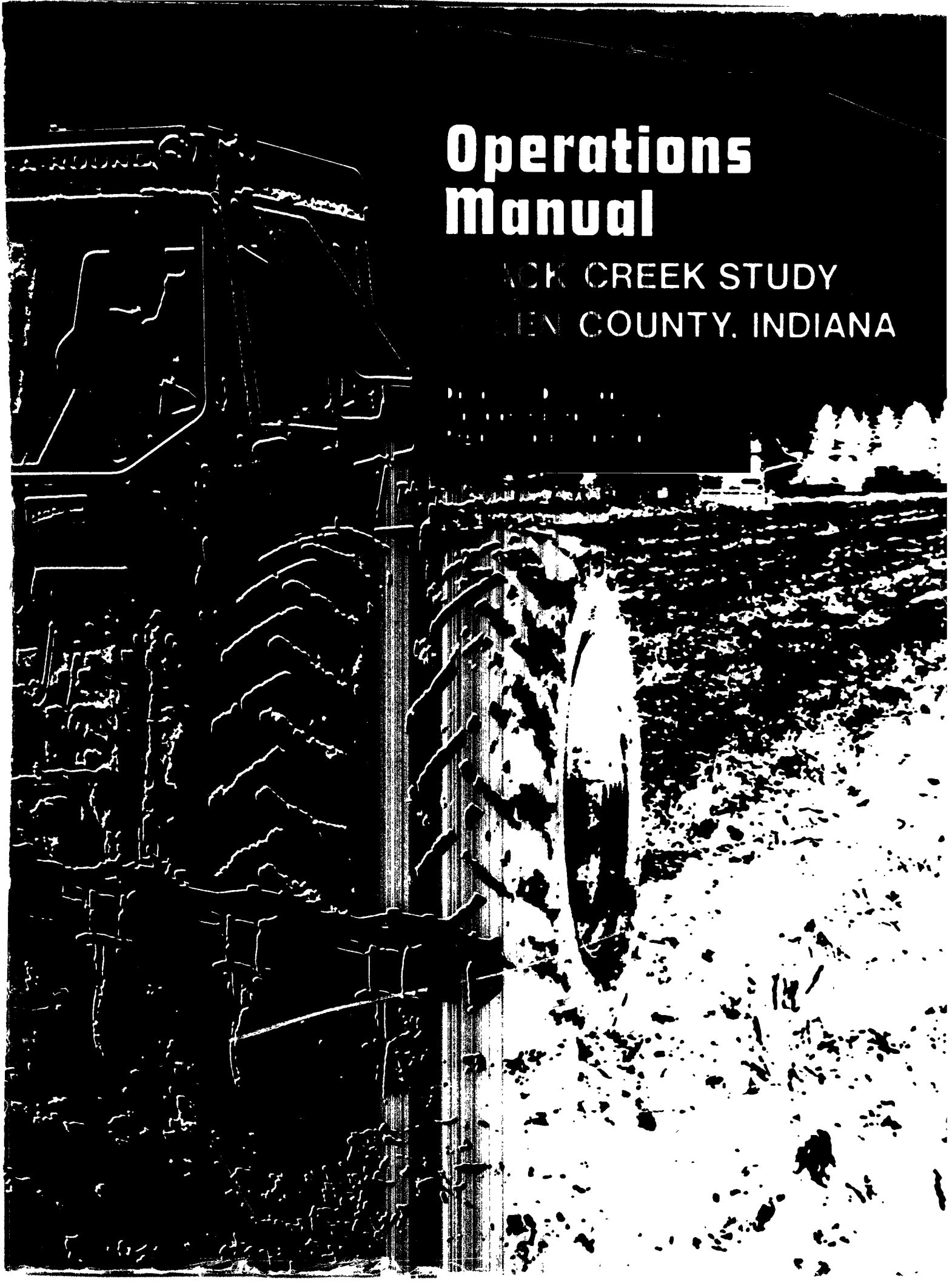
Operations Manual

ICK CREEK STUDY
EN COUNTY, INDIANA



Project No. G005103 EPA-905-74-002

ENVIRONMENTAL IMPACT OF LAND USE on WATER QUALITY

** OPERATIONS MANUAL **

for the
Black Creek Study
Maumee River Basin
Allen County, Indiana

Reduction of Sediment
and Related Pollutants
in the
Maumee River
and
Lake Erie

Allen County SWCD, Project Administrator
Ellis McFadden

Allen County SWCD, Project Director
James E. Lake

U.S. Environmental Protection Agency, Project Officer
Carl D. Wilson

Prepared by

ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT

for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region V, Office of the Great Lakes Coordinator, Section 108A Program
Chicago, Illinois
with assistance from
USDA SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY
FOURTH CONGRESSIONAL DISTRICT INDIANA

March 1974

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FOREWARD

This handbook contains the basic policies, regulations, and specifications for the administration of the Black Creek Study Program.

The Black Creek Study came about through the efforts of the Allen County Soil and Water Conservation District, Board of Supervisors, (Indiana). The district submitted a proposal to the Environmental Protection Agency to study the relative success of various existing erosion control techniques in improving water quality; the effect of various land use and agriculture practices on erosion and the resulting effect on sedimentation and related pollutants as they relate to water quality. The study will also identify the type of incentives that will be needed to convince individual landowners to voluntarily participate in erosion control programs.

It is hoped that data obtained from this study can be applied specifically to the Maumee Basin, and in general to other areas to reduce sedimentation and improve water quality.

Mention of trade names or commercial products in this manual does not constitute endorsement or recommendation for use.

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Section I
BASIC POLICIES

The Black Creek Sediment Study shall emphasize the land use changes, erosion control, and management practices, which in combination by conservation treatment units, will provide, over a period of years, the most enduring conservation benefits for the purpose of reducing sediment and improving water quality.

The program is fully voluntary on the part of the individual landuser (cooperator). Its voluntary character shall be continuously emphasized.

Any landuser in the Black Creek Study Area, is eligible to become a cooperator with the Allen County Soil & Water Conservation District and participate in the land treatment program.

A plan of operations, including a time schedule by conservation treatment units, shall be a prerequisite to participation in the program.

The cooperator will be responsible for developing and carrying out his plan of operations. The SWCD, will provide technical assistance to any cooperator for developing the plan of operations.

The SWCD shall offer to cooperators long-term contracts under which the SWCD, with the approval of the U.S. Environmental Protection Agency Project Officer, will make committments to share with the cooperator the cost of establishing the combination of conservation practices provided for in his plan of operations. These contracts may be entered into during the period ending no later than December 31, 1976. No contract shall exceed the end of the program period (September 30, 1977).

The cooperator will be encouraged to carry out his plan of operations in the shortest period consistant with climatic conditions and his resources.

The program shall make provision for contracts on all lands, including non-farm lands where erosion is so serious as to make such contracts necessary for the reduction of sediments and related pollutants.

The program shall provide for inclusion in contracts, at the exclusive decision of the landowner, practices and measures to reduce sedimentation and to enhance the environment; and reduce non-point sources of pollution.

The program shall be carried out in close cooperation with interested federal, state and local governmental units and organizations and other groups and individuals.

Funds to administer this program are provided by the U.S. Environmental Protection Agency, State and County Government and local landowners.

The program committee, consisting of the SWCD, SCS, Purdue University and the U.S. EPA will assist in developing and reviewing policies and general operating procedures best suited to the Black Creek Study Area. Representatives of other interested agencies or groups working in the area may be invited to participate as determined by the above committee.

Cost-share incentives for land treatment will be provided on the basis of funds granted to the SWCD by the U.S. EPA.

The plan of operations shall cover all land owned, or controlled for the period of the contract, by the cooperator.

The cooperator shall be provided with soil survey information with necessary interpretations to use as a basis for preparing a plan of operations.

The list of soil and water conservation practices as set forth in the work plan (Table A-10) for Black Creek Study will be eligible for cost-sharing when applied in combinations set forth in the plan of operations. (Also see Appendix I).

APPROVED: _____

Project Administrator
Chairman, Allen County SWCD

3-22-74
Date

Section II
ADMINISTRATION

2.1 Definitions

The succeeding terms shall have the following meanings in this handbook and all contracts, forms, documents, instructions, and procedures in connection therewith, unless the context or subject matter requires otherwise.

(a) SWCD means the Allen County Soil and Water Conservation District.

(b) BCSA means Black Creek Study Area which is the currently recognized area as outlined in the work plan.

BCSP means Black Creek Sediment Program.

(c) SCS means the U.S. Soil Conservation Service.

(d) EPA means the U.S. Environmental Protection Agency.

(e) PU means Purdue University.

(f) Operating unit means a parcel or parcels of land whether continuous or non-continuous, constituting a single operating unit for agricultural purposes.

(g) Other land means non-farm land that can be covered by the program to the extent necessary to reduce sediment and related pollutants.

(h) Cooperator means any landuser having control of an operating unit in the designated area and voluntarily entering into a cooperative agreement with the SWCD.

(i) Conservation practice or conservation measures means any process used to protect the soil from water or wind erosion and deterioration or any process to develop or use a soil and water resources. The terms "eligible conservation practice" or "eligible conservation measure" refers to those practices listed in Table A-10 of the work plan.

(j) Conservation treatment unit means a field of an operating unit or part of an operating unit in a specific land use requiring a particular type of management and the use of related conservation practices.

(k) Plan of operations means a written conservation plan for all the acreage of an operating unit incorporating a time schedule of landuse and treatment and providing for such combinations of landuse adjustments such as cropping or grazing systems, and conservation measures as are needed to develop, use and

protect the soil and water resources. It includes estimated cost-share amounts, by year, for each eligible conservation practice.

(l) Time Schedule of Land Use and Treatment means a schedule of planned land treatment, listed by fields and by years for an operating unit included in the plan of operations.

(m) Identifiable Unit means all or an essential part of an eligible conservation practice that, when carried out, can be clearly identified as a segment of the whole practice.

(n) Cost-Share Payments means payments to cooperator signatory to the contract as provided in the plan of operations, at established rates, for the carrying out of identifiable units for which costs are shared, and who have complied with the applicable provisions of the contract.

(o) Contracting Officer shall be an employee of the SWCD designated by the Board of Supervisors to handle the contractual agreements.

(p) Designated SCS Representative means the Soil Conservation Service, District Conservationist at Fort Wayne Field Office or in the absence thereof the employee of the Soil Conservation Service named by the District Conservationist.

(q) Certification of Performance and Compliance means a written statement by the designated SCS representative that an identifiable unit has been properly carried out and that the cooperator signatory to the contract is in compliance with the terms and conditions of the contract.

(r) Actual Cost means (1) the amount actually paid or engaged to be paid by the cooperator for equipment use, materials and services for carrying out an identifiable unit, or (2) if the cooperator uses his own forces in carrying out an identifiable unit, the constructed value of his own labor, his own equipment use, materials he produced and used, and such other costs as may be set forth in the list of eligible conservation practices.

(s) Average Cost means the average of the actual costs and current cost estimates considered necessary to carry out an identifiable unit.

(t) Specified Maximum Cost means the maximum amount, with respect to an identifiable unit to which cost sharing will apply.

2.2 Authority and Responsibility (see Figure 2.1)

2.2.1. The Allen County Soil & Water Conservation District

The Board of Supervisors of the Allen County SWCD of which two are appointed by the Governor of Indiana and three are elected by the county landowners have overall administrative responsibility for the program. All program activities are reviewed at monthly board meetings. The chairman of the board acts as the project administrator.

The project administrator is responsible for the administration of the BCSP and shall:

(a) Serve as chairman of the program committee and as such shall:

  (i) Schedule meetings of the committee
  (ii) Arrange for keeping minutes of meetings

(b) Issue all instructions and policies required in addition to those contained in this handbook to implement and carry out the program;

(c) Carry out the duties and responsibilities with regard to appeals as set forth;

(d) Carry out the duties and responsibilities with regard to contract violations as set forth;

(e) Maintain relations with other local, state and federal agencies to assure continuation of assistance;

(f) Appoint in writing the project director and inform all participating agencies of the appointment.

2.2.2 The Project Director (PD)

The project director is the direct representative of the Allen County SWCD and as such, is responsible for the conduct of the project. All technical direction and guidance for construction plans and specifications, analytical work, evaluation of plans, reports, voucher preparation, time schedules, etc., are channeled through him to the U.S. EPA project officer.

The project director is responsible for directing the Black Creek Study Program and shall:

(a) Serve as contracting officer in accordance with the authority delegated by the project administrator and as such is responsible for:

(i) Receiving and reviewing plans of operations for legal adequacy as a basis for contracts.

(ii) Preparing the contractual agreement between the District and the Cooperator using the forms prescribed by the SWCD.

(iii) Oversee the contract through the program period to see that all requirements are met by both parties.

(b) Provide direct supervision and training to district employees.

(c) Coordinate activities of technical personnel in accomplishing program objectives.

(d) Encourage, regular on-site spot checks to insure that practices are being carried out in accordance with the plans of operations and the terms of the contract.

(e) Perform other related duties directed by the SWCD board.

(f) Develop and carry out an information program.

(g) Maintain all District related records.

(h) Maintain all District financial records.

(i) Review applications with SWCD board to determine priorities.

(j) Serve as chairman of the program committee and perform related duties in the absence of the project administrator.

2.2.3 Project Officer (PO)

The project officer is the official representative of the U.S. EPA designated to monitor the project. Federal technical assistance and guidance relative to the project are channeled to or through him. His general responsibilities are to:

(a) Meet with the grantee and outline (in general) procedures for accounting, preparation of plans and specifications, reports, purchases, assurances and reimbursement procedures.

(b) Assist the grantee in conforming to the objectives (scope of work) set forth in the project application and "offer and acceptance" (O&A) documents.

(c) Review project detailed work plans and budget as described in the [illegible] document and provide approval to proceed.

(d) Review and approve construction plans allowing the grantee to proceed.

(e) Review the final plans and specifications and provide notification to the grantee of approval to advertise for bids.

(f) Review bid tabulations, proof of advertising, and other necessary assurances before granting authority to award construction or equipment contract. Approval must be obtained from project officer before contract can be awarded to the low or best choice of bidders.

(g) Review and authorize proposed purchases for articles, supplies, equipment and services having a unit value exceeding $1,000.00. (The obtaining of a grant does not in itself constitute prior approval, even though these were itemized in the application for a grant).

(h) Determine that provisions for reasonable access to the project site and project results have been made.

(i) Perform inspections and program reviews and provide technical assistance to the project.

(j) Certify that the cost included in a voucher, were necessary to the conduct of the project, the amounts claimed are reasonable, and all required reports were received and are satisfactory.

(k) Designate those materials that are no longer necessary to the completion of the project.

(l) Review a preliminary copy of all final project reports and provide approval to proceed with preparation of the final reports.

(m) Review and approve publications or other dissemination of information.

2.2.4 Soil Conservation Service

The Soil Conservation Service is responsible for providing technical assistance to the SWCD to implement the land treatment portion of the Black Creek Study "work plan". To fulfill this responsibility the SCS shall:

(a) Provide technical assistance to cooperators in developing their plan of operations.

(b) Jointly review all plans of operations with the District governing body.

(c) Provide technical assistance to the cooperator in carrying out the plan of operations.

(d) Arrange for nonresident SCS technical assistance as needed in cooperation with the project director.

(e) Inform project director of all alleged or suspected violations.

(f) Make an annual progress review and report of each current contract.

(g) Make final on-site review and report of all completed contracts.

(h) Maintain a complete file of current technical specifications for eligible conservation practices.

(i) Maintain all SCS records.

(j) Perform other related duties as requested by the SWCD board.

2.2.5 Purdue University

Purdue University has contracted with the SWCD to do research on the BCSP. In doing so, they are responsible for providing materials and personnel to carry out the following activities:

(a) Modeling and prediction in the study area.

(b) Sociological studies.

(c) Monitoring of runoff, sedimentation, etc.

(d) Laboratory analysis.

(e) Experimental plots.

(f) Rainulator studies.

(g) Biological studies.

(h) Ditch bank studies.

(i) Filtration studies (related to tile drains).

(j) Provide quarterly and annual progress, technical and financial reports to the SWCD.

2.2.6 Typical Flow Diagram of Grant Process

Figure 2.2 contains elements that are typical of most Section 108A. Planning or Demonstration Projects. The explanations that follow are listed to correspond to the sequence of events identified on the diagram:

(a) Region V, Chicago Office, EPA (appointment by the Regional Administrator), appoints project officer from among EPA personnel to provide assistance to the grantee. He is the federal representative with whom all correspondence, direction, questions, approvals and requests shall be channeled to or through.

(b) The EPA project officer shall meet with the grantee and his representatives to discuss the project and begin the action toward accomplishing the objectives of the project. Items to be reviewed are principally those concerned with the responsibilities of the PD and PO.

(c) Instructions are given to the grantee by the PO. Questions are welcomed by the PO so that clarification can be made on any point not understood by the grantee. The granteee shall develop a work plan and submit it to the PO for approval.

(d) PO shall review the work plan to see that it will provide the information necessary to accomplish the objectives of the project. He will offer comments for consideration if he feels it will help accomplish the objectives. He will send either his comments and/or approval of the plan so that you can proceed.

(e) The grantee shall prepare and submit two copies of plans and specifications to the PO for review and approval prior to advertising for bids.

(f) PO reviews plans and specifications and sends letter of approval to grantee to advertise for bids. Grantee advertises for bids on the approved plans and specifications.

(g) Grantee prepares bid tabulation, provides proof of advertising, selects successful bidder and submits copy to the PO for approval.

(h) PO reviews bid tabluations and sends letter to grantee authorizing the contract award to the successful bidder (if other than the low bidder is selected, a brief explanation of the decision is needed).

(i) Grantee receives approval from PO to award contract. When contract is awarded, two signed and certified copies should

be forwarded to the PO. Procurement of equipment or construction of facilities can begin.

(j) Construction of facilities are completed and evaluation begins.

(k) Grantee evaluation period for project. PO will be in contact from time to time during this period. Draft of the final report will be prepared and submitted to PO for review.

(l) PO reviews draft of final report. Comments will be made by PO to grantee.

(m) Grantee shall prepare the final report as shall be outlined by the PO. Format will be given to grantee as project progresses. Number of copies of the final report will be given in the offer and acceptance document as specified by the PO.

(n) The PO shall request an audit of the project account so that final payment can be made. The PO submits the final report to the Regional Administrator for distribution and grant completion.

(o) The Regional Administrator, Region V, receives the final report for distribution.

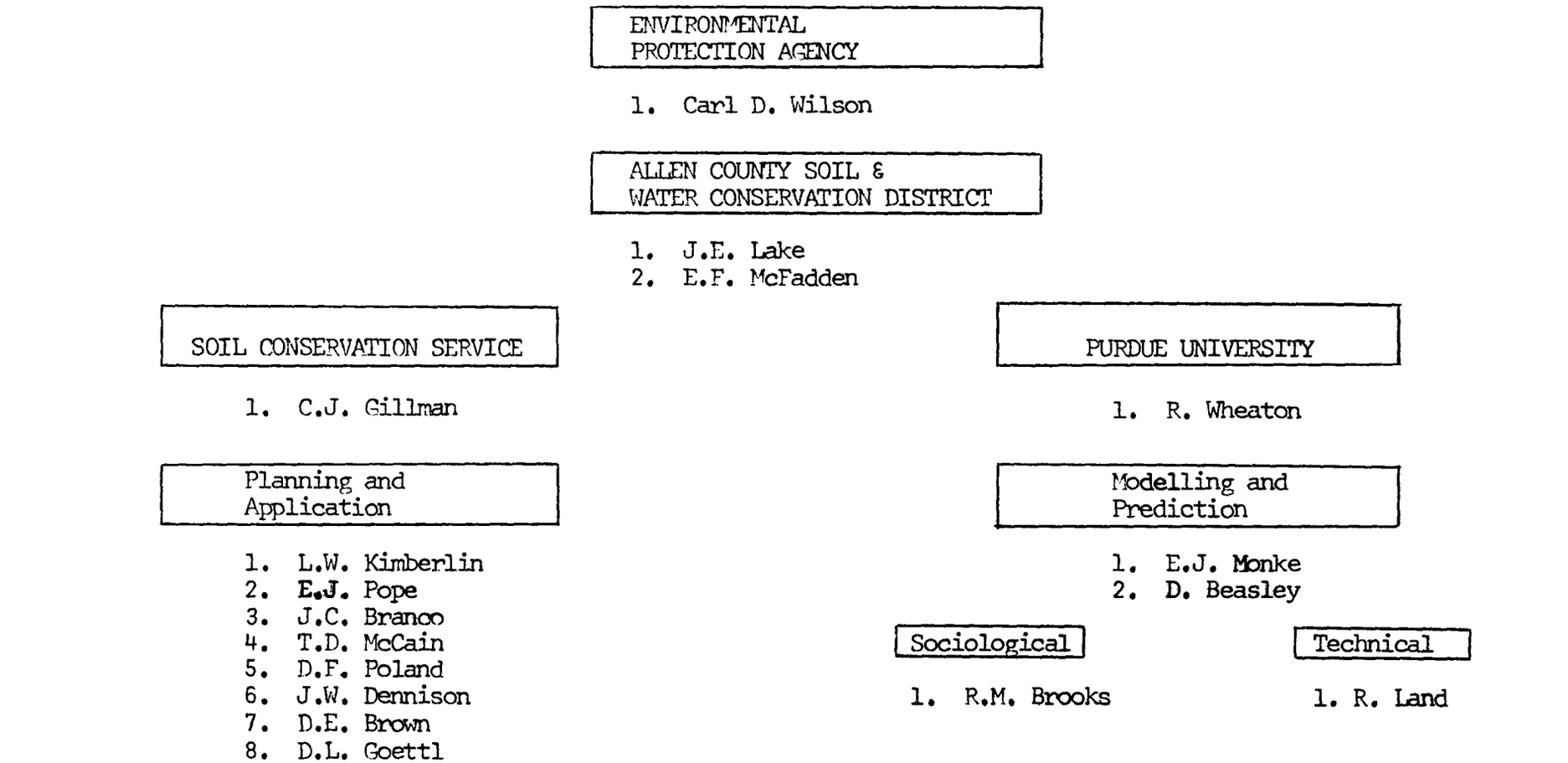
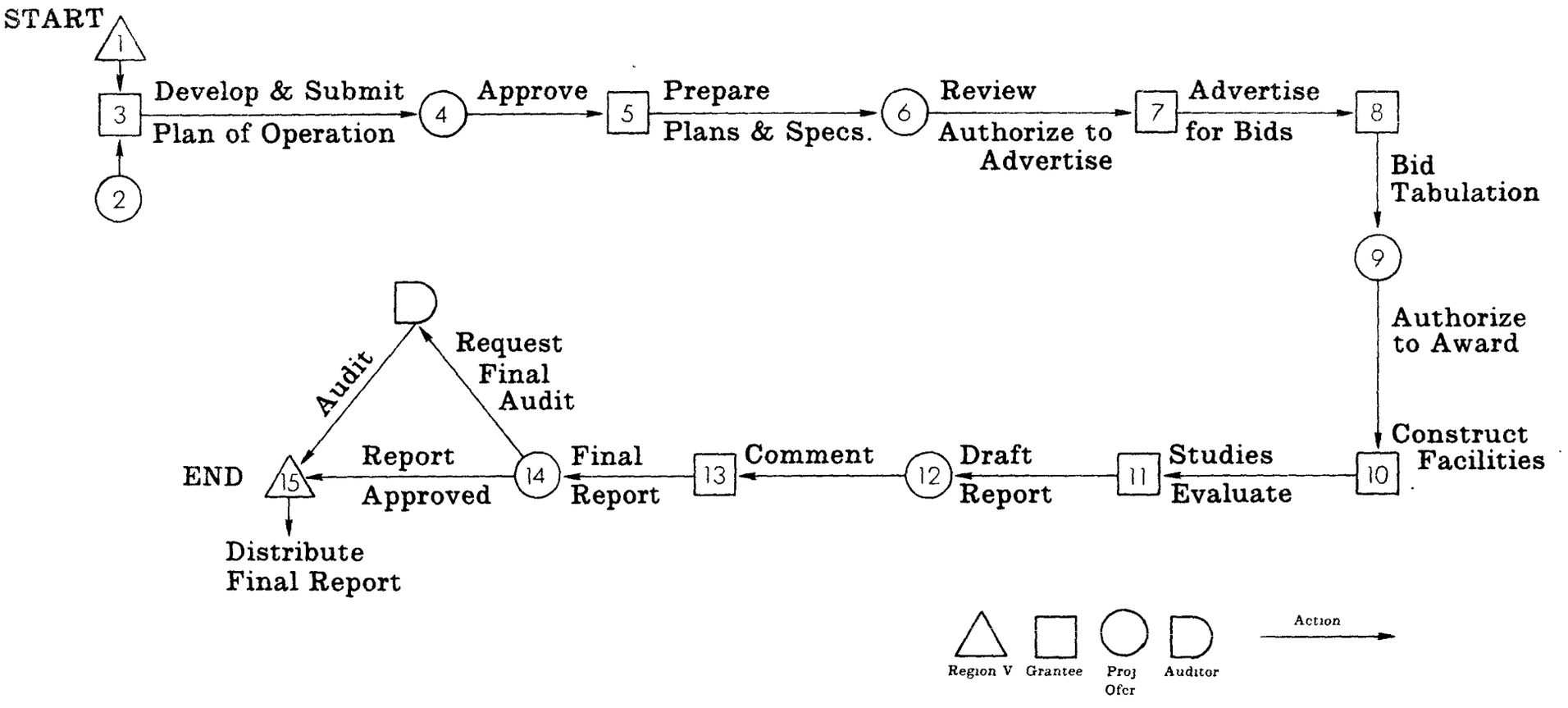

ENVIRONMENTAL PROTECTION AGENCY
1. Carl D. Wilson
ALLEN COUNTY SOIL & WATER CONSERVATION DISTRICT
1. J.E. Lake
2. E.F. McFadden
SOIL CONSERVATION SERVICE
1. C.J. Gillman
PURDUE UNIVERSITY
1. R. Wheaton
Planning and Application
1. L.W. Kimberlin
2. E.J. Pope
3. J.C. Branco
4. T.D. McCain
5. D.F. Poland
6. J.W. Dennison
7. D.E. Brown
8. D.L. Goettl
Modelling and Prediction
1. E.J. Monke
2. D. Beasley
Sociological
1. R.M. Brooks
Technical
1. R. Land
Monitoring
1. J.L. Hamelink
2. E.J. Monke
3. R. Wheaton
Laboratory Analysis
1. G.W. Nelson
2. L.E. Sommers
3. E. Hood
Experimental Plots
1. H.M. Galloway
Rainulator Studies
1. J.V. Mannering
Biology Studies
1. J.L. Hamelink
2. W.P. McCafferty
Ditch Banks
1. R. Wheaton

FIGURE 2.1


START
1
2
3
Develop & Submit
Plan of Operation
4
Approve
5
Prepare
Plans & Specs.
6
Review
Authorize to
Advertise
7
Advertise
for Bids
8
Bid
Tabulation
9
Authorize
to Award
10
Construct
Facilities
11
Studies
Evaluate
12
Draft
Report
13
Comment
14
Final
Report
15
END
Report
Approved
Audit
Request
Final
Audit
Distribute
Final Report
Region V
Grantee
Proj
Ofcr
Auditor
Action

Section III
APPLICATION

3.1 Application for Program Assistance

Application by cooperators of farm or other lands shall be made on Form BCS-1, see Exhibit. Group application made on Form BCS-1a see Exhibit.

The application should be dated and signed by the applicant and show:

(a) Description and location of the farm or other lands.

(b) Who owns and who operates the farm, or other lands. If the applicant is not the owner, the application should show under what arrangements the applicant occupies and operates the land; e.g. lease, permit, etc. The term of the lease or permit should be shown.

Only one copy of the application is required. Applications shall be filed with the SWCD.

3.2 Cooperators Applications Received

The priority for participation in the program shall be determined and shown on each application.

A register of applicants received is required.

3.3 Cooperators Eligibility

Any cooperator who has control of an operating unit in BCSA, is eligible for participation in the BCSP provided that (1) the cooperator submits an acceptable plan of operations, and (2) has control of the operating unit for a period required to carry out the plan of operations. Control as used herein means ownership or documented proof of control for the contract period. It is the responsibility of the cooperator who has made an application on Form BCS-1 to provide evidence acceptable to the project director what he has control of all of the operating unit, for the period that will be required to carry out an acceptable plan of operations, before any technical assistance is furnished.

3.4 Land Eligibility

The program shall be applicable to (1) privately owned lands, (2) non-federally owned public lands under private control for the contract period and included in the cooperator's operating unit.

3.5 Priority of Applications for Participating in the Program

The project director shall review all applications, Form BCS-1, with the SWCD Board of Supervisors and set the priority of assistance to applicants in developing the plan of operations.

3.6 Priority of Technical Assistance to Cooperators

After the planning priorities have been established, the following factors shall be considered in setting technical assistance priority:

(a) The work plan and objectives of the BCSP

(b) Seriousness of the soil and water problem, including its relationship to sediment and agriculture related pollution

(c) The need for simultaneous action by two or more cooperators in controlling erosion - a group of cooperators, each in individual applicant, agreeing to coordinated action in meeting erosion problems would ordinarily be preferred over the individual applicant

(d) The need for revegetation of land being used for crops not suited for cultivation

(e) Urgency for application of conservation measures to solve recurring seasonal problems such as wind or water erosion on critical areas

(f) Time of filing application in relation to other applicants

(g) Interest and attitude of applicant and his understanding of the program.

Section IV
PLAN OF OPERATIONS

The cooperator is responsible for developing a plan of operations. An approved plan of operations developed in cooperation with the SWCD shall form a basis for negotiating a contract. Available technical assistance in preparing the plan of operations will be provided by SCS.

The SCS Resource Conservation Planning handbook and technical guide amended for use in BCSP prescribes the minimum requirements for the plan of operations. Each plan of operations must be approved by the SCS District Conservationist.

4.1 Selection of Conservation Practices

The cooperator on the operating unit shall determine how he will use his land and the combination of conservation practices he will use in treating each conservation treatment unit.

The conservation practices agreed to be carried out shall be carried out in conformity with the plan of operations. Conservation practices shall be carried out in accordance with the current specifications obtained from the local Soil Conservation Service office.

Practices to be included in the plan of operations, shall be a voluntary decision of the cooperator.

Measures planned on lands not eligible for cost-share, but which are part of the operation unit shall be included in the plan of operations.

The following statement must be included in the plan of operations with the item to which it applies properly referenced:

> "Conservation measures on land not eligible for cost-share under the contract. The cooperator will not be in violation or non-compliance if these practices are not carried out."

The plan of operations (see Exhibit Form BCS-2) shall show:

(a) Planned treatment for each conservation treatment unit. The practice to be applied shall be identified and each identifiable unit shall be listed.

(b) Estimated extent or amount of each identifiable unit.

(c) Average cost, or specified maximum cost, current at the time the plan is developed for each identifiable unit.

(d) Cost-share rate for each identifiable unit.

(e) Time schedule, by year, for carrying out each identifiable unit.

(f) Estimated total cost share, by year, for each identifiable unit.

(g) Certification of technical adequacy by the District Conservationist.

.2 The Conservation Treatment Unit

The conservation treatment unit shown in the plan of operations will be a field or a group of fields with similar soil and water conservation problems and requiring similar combinations of landuse, cropping or grazing systems, and conservation practices.

.3 The Time Schedule of Land Use and Treatment

Land use changes, use of cropping or grazing systems, and application of conservation practices are closely interrelated. Proper timing and sequence of land treatment is essential to successful implementation of conservation plans. The time schedule shall provide a sequence for carrying out planned conservation measures.

The plan of operations may provide that specified identifiable units may be carried out at any time prior to or not later than one year after the year shown in the time schedule.

The time schedule must be realistic. Schedules must consider not only proper sequences but must take into consideration availability of contractors, cooperator's ability to complete work, and urgency of planned treatment. In addition, adequate time should be provided following the application of certain practices, to determine proper establishment.

It is, therefore, SWCD policy to schedule initial grass seedings, tree and shrub plantings, or application of management practices, such as crop residue use or pasture management as early as practicable in contract schedules.

.4 Technical Assistance

The SCS will provide technical assistance to the cooperator in developing and carrying out a plan of operations under the program. The cooperator will be encouraged to use all other available sources of assistance in developing and carrying out his plan of operations.

The project director is responsible for scheduling technical assistance requested by the cooperator. The SCS representative is responsible for assistance in site selection, layout, and necessary supervision of the installation of the practices in the plan of operations. The cooperator will be encouraged to use all other available public

and private sources of assistance in the installation of practices whether they are to be cost-shared or not. The project director will receive assistance from the SCS representative to make arrangements with the Area Conservationist for services of SCS employees not located in the field office.

4.5 Plans of Operations that Involve Groups

Cooperators, in the BCSA may, with the prior approval of the project director, include two or more operating units under contract in the program if a group plan of operation satisfactory to the SCS representative is developed and will result in a better land use and treatment program for the operating units through joint participation than would be obtained through individual operating unit participation.

4.6 Plans of Operations Involving Units of Government

In some instances, the most practical location for conservation practices, such as grade stabilization structures and erosion control basins, that are required may be on adjoining road rights-of-way where the county can also use the conservation practice to advantage in the installation of road crossings of water courses. In such cases the cooperator may receive cost-sharing assistance under the BCSP in carrying out the conservation practice. Cost-sharing assistance to the cooperator would be limited, to that necessary to install the conservation structure using the standard SCS specifications and rates applicable to the practice and outlined in the handbook. Any additional expense for structural work or materials that may be required to render the practices, serviceable as a road crossing must be an obligation of the unit of government. For example, if a sediment dam is to be constructed with a greater height or width than is required to impound runoff water in order for it to also serve as a roadway, cost-sharing shall be limited to that which would have been payable for a dam on the minimum SCS specifications required to meet the needs of the site for a sediment basin.

The cooperator and the unit of government shall execute a cooperative agreement covering the working arrangements, division of costs and responsibilities for construction and maintenance and such other matters as may be pertinent. Copies of the agreement will be provided for the Allen County SWCD files.

Where a structure is designed for a road crossing, the plans and specifications for that portion of the structure pertaining to the roadway shall be in accordance with standards established by the unit of government. The authorized representatives of the unit of government must occur in the plans and specifications. Such concurrence must be in writing and made a part of the contract.

4.7 Approval of Plan of Operations

The plan of operations developed by a cooperator must meet the approval of the district conservationist. The district conservationist in making the decision that the plan of operations is a satisfactory basis for a long term cost-sharing contract is acting for the project director. The primary criteria for this decision is whether the plan, within practical limits, provides for the use of the land within its capabilities and its treatment is in accordance with standards and specifications set forth in the SCS technical guide as ammended for use in the BCSP. When the district conservationist is convinced that the plan of operations meets regulations he shall sign BCS-1 and BCS-2.

4.8 Soil Conservation District Review

The project director shall provide an opportunity for the supervisors to review plans of operations developed by the cooperator and the soil conservationist.

In the event such a plan is not concurred in by the supervisors and/or the project administration because, in their opinions, it does not meet the objective of the district or there is some question as to its practicability the project director shall so advise the district conservationist. The district conservationist together with the project director, soil conservationist and the cooperator, shall endeavor to work out a plan acceptable to all. The final plan must, of course satisfy the criteria with respect to its adequacy. In case agreement cannot be reached, the matter will be referred to the SWCD Board of Supervisors, who will make the final decision.

When supervisors have reviewed a plan, evidence of such review shall be shown on the plan of operations.

4.9 Certification by Contracting Officer (project director)

The project director will certify that the plan of operations has been reviewed with the supervisors of the SWCD and that it meets requirements for participation in the BCSP and is adequate for a cost-share contract. This shall be accomplished on Form BCS-2,3.

4.10 Carrying Out the Plan of Operations

The cooperator is responsible for carrying out his plan of operations He should be encouraged to carry it out as rapidly as climatic conditions and his own resources permit in conformity with the priority of practice installation set in the plan of operations.

4.11 Annual Review of Plan of Operations

Each cooperator in the BCSP who had developed a plan of operations will be contacted at least once each year. This contact will be mad

by the SCS personnel working on the project. Progress of the plan of operations will be discussed and the results will be recorded on Form BCS-9, Annual Status Report.

All cooperators will be contacted by June 30th of each year. The Annual Status Report will be completed by the SCS representative and submitted to the contracting officer and the SWCD for their reviews.

Section V
CONTRACTS

Contracts shall be based on the cooperator's plan of operations and shall be developed in coordination with the project director.

The project director is the contracting officer and is responsible for the legal sufficiency of the contract.

The beginning date of a contract is the day it is signed by the cooperator. The contract is not binding on the part of the district until (1) the contract is signed by the project administrator and (2) the contracting officer certifies that funds are available for the cost-sharing obligation of the contract. See contract forms BCS-2 and BCS-3 (see Exhibit #2 and #3).

In order for cooperators to participate in the program, a contract must be entered into by him for the contract period by which he shall agree to carry out his plan of operations. The person who has control of the operating unit for the proposed contract period, must sign the contract.

The contract shall be for a period that is needed to carry out and establish the conservation practices listed in the plan of operations and for which federal cost-share committments are made under the program. Contracts may be entered into during the period ending no later than December 31, 1976. The period of any contract shall not exceed the end of the program period. (September 30, 1977).

The contracting officer having determined that the plan of operations is adequate for a contract may execute the contract with the cooperator subject to certification by the EPA project officer. It is the responsibility of the cooperator who signs a contract to keep the contracting officer informed of his mailing address.

If, during the contract period, all or part of the right and interest of any cooperator signatory to the contract in an operating unit is transferred by sale or otherwise, his successor, as transferee, during the contract period may upon his request be substituted under the contract for that transferred by executing a form prescribed by the SWCD for such purposes.

Contracts previously entered into with a cooperator may be terminated upon mutal agreement of the cooperator and the contracting officer, only if such termination is specifically approved by the SWCD. No contract may be so terminated unless the SWCD determines that such termination would be in the public interest.

Requirements of contracts previously entered into with a cooperator may be waived or modified by the contracting officer only if such waiver or modification is specifically approved by the SWCD, or is authorized under general policies established by the SWCD.

The contracting officer may find, in accordance with standards determined by SCS, that an identifiable unit has been carried out in accordance with applicable program provisions but, due to conditions beyond the control of the cooperator signatory to the contract, has failed to achieve the desirable results. In such cases the contracting officer and/or the SWCD may agree to modify the contract to authorize cost-share payments for again carrying out the identifiable unit: Provided, that the remaining period of the contract is of such length of time as to allow the carrying out and establishment of the identifiable unit. The cooperator may not be required to again carry out an identifiable unit that has failed due to conditions beyond his control.

The contracting officer may find, in accordance with standards determined by the SCS, that an identifiable unit has been carried out in accordance with applicable program provisions and has achieved the desired results but, due to conditions beyond the control of the cooperator signatory to the contract, subsequently deteriorated during the contract period to the point of need of repeat applications. In such cases the contracting officer and/or the SWCD may agree to modify the contract to authorize the cost-share payments for again carrying out the identifiable unit: Provided, that the remaining period of the contract is of such length of time as to allow the carrying out and establishment of the identifiable unit. The cooperator may not be required to again carry out an identifiable unit that has deteriorated due to circumstances beyond his control.

5.1 Practices Already on the Land

If practices on the land at the time a BCSP contract is entered into where cost-shared under another program, the cooperator's obligations, if any, with regard to such practices remain with the agency that cost-shared in carrying out the practices. However, maintenance of such practices may need to be specified in the BCSP contract.

A BCSP contract does not relieve a cooperator from any obligations with another federal agency for practices carried out under another program before or after a BCSP contract is entered into.

Practices on the land that are complete at the time a BCSP contract is entered into may be utilized in carrying out the contract or in carrying out another practice or identifiable unit of a practice that is to be cost-shared under the BCSP. Cost-sharing by an agency for practices carried out before a BCSP contract is entered into, does not affect cost-sharing under the BCSP.

When it is planned by a BCSP contract to break up or destroy a practice on the land at the time a contract is entered into, the Soil Conservationist must make inquiry of the cooperator if such practice were cost-shared under another program. If such practices were cost-shared under another program, the cooperator must furnish evidence to the project

director that all obligations with regard to such practices have been met. A record of such evidence shall be included in every copy of the contract.

5.2 Conservation Practices Maintenance

Each cooperator signatory to the contract shall agree to maintain for the contract period, or if lesser, for the period of his control of the operating unit, conservation practices on the operating unit as specified in the contract. Failure to maintain for the required period the conservation practices shall be considered a contract violation.

5.3 Other Programs

In developing a conservation plan, SCS technicians assisting the cooperator and the cooperator must recognize that a BCSP contract does not relieve a cooperator from obligations he may have under any other program.

5.4 Cooperator Control of Land

Contracts may be entered into with cooperators who have control of the land units for the contract period. Control means ownership or a long-term lease of the land unit under contract. It is the cooperators responsibility to provide the contracting officer with proof of control should it be requested.

When a cooperator is buying a land unit on contract, he must show proof that he is buying the land and that he has control of this land for the period of the BCS contract.

In all cases the cooperator is to be informed of the consequences if he looses control of the operating unit prior to completion of the contract.

Every cooperator who has control of an operating unit to be included in a BCSP contract must sign the contract.

5.5 Contract Item Number

A separate contract item number will be assigned to each practice. This number will be the same as that used in the data processing system for computing this program.

5.6 Second Contracts

For the purpose of protecting the investment of the District a second contract may be entered into on the same operating unit with the same or a new cooperator for the purpose of repairing or reconstructing practices supplied under the BCSP that failed or

deteriorated provided such failure or deterioration was beyond the control of the cooperator.

As used in this section, the term, "the same operating unit" means (1) originally under a contract less any acreage transferred by sale or otherwise, and (2) land originally under a contract plus any added acreage that is not substantial in size with relation to the original acreage.

5.7 Time Limitations

All contracts on an operating unit shall be for the same time length as the program period which ends September 30, 1977. However, the period or the initial or first contract shall not be less than 1 year (12 months) nor more than 3-1/2 years (42 months, except contracts involving transfer of only a part of an operating unit which does not become part of another operating unit under contract may be for less than 36 months. All contracts will start on the day it is signed by the cooperator, contracting officer and the SWCD.

5.8 Contract Modification

Changes in contracts shall be accomplished by Form ECS-4, Modification (or waivers) of contract, see Exhibit.

The effective date of a contract modification shall be the day it is signed by the cooperator. The modification is not binding on the part of the District until (1) the contracting officer certifies that funds are available and (2) the project administrator approved the action.

The cooperator is on his own so far as any cost-sharing is concerned for an identifiable unit(s) started before the modification is signed by the above listed parties.

The reason for any changes in a contract must be clearly stated on the modification Form ECS-4; changes that may require contract modifications are:

(a) Adding land to an operating unit

(b) Deleting land from an operating unit

(c) Changing the period of the contract

(d) Adding contract items

This includes adding an item to provide for the reapplication of a practice that has failed. When a contract item is added or deleted which will change the land use of a field, such as pasture land seeding, then the appropriate management practice must also be adjusted or added to the contract.

(e) Deleting contract items

A contract should contain all of the practices required for a plan of operations that will serve the needs of the cooperator and accomplish the objectives of the BCSP. When the cooperator signs the contract, he is expected to carry out all of the practices. There must be a valid reason not adverse to the SWCD's interest for deleting any contract item. Every modification to delete a contract item must show the reasons for the deletion. Modifications and pertinent attachments must be prepared in a manner which will permit anyone to clearly identify and locate any affected practice.

When a contract modification brings about changes in the contract that are not readily apparent on the plan map, an overlay or sketch map must accompany the modification to reflect these changes, this includes seeding, stripcropping, and windbreaks in only part of a field. If two or more of the same practice - such as two diversions - are located in the same field, they should be numbered or lettered, Diversion #1, Diversion #2, or Diversion A, Diversion B.

(f) Changing specifications or material

To permit the use of any supply or material other than that specified in the contract, provided the substitution adequately meets standards and specifications set forth in BCSP Technical Guide.

(g) Increasing average costs and specified maximum costs

If an average cost increases between the time a contract is written and the time an identifiable unit is begun, contracts may be modified to permit cost-share payment based on the increased average cost. This does not mean that because average costs increase, contracts must be modified to reflect increased average costs. Because of the cost of preparing and processing modifications, contracts should not be modified unless failure to do so would result in a significant loss to the cooperator. Modifications to increase average costs and specified maximum costs should be limited to the current year. Modifications to increase average costs or specified maximum costs only, and that involve no other change, need to be signed only by the project director and SWCD. The signature of the cooperator is not required, provided the following clause is included in the modification:

"This modification reflects increases in approved average costs or specified maximum costs. The SWCD agrees to cost share on the average costs or specified maximum costs cited herein. The cooperator's initial action to carry

out the contract items covered by this modification shall be deemed to be his acceptance of this modification."

(h) Changing the amount or extent of a practice

Modification to change the amount or extent of a practice shall be executed only when the increase or decrease in extent is (1) known before actual installation, and (2) will result in a significant increase or decrease in the cost-share obligation. The SWCD shall determine what they wish to consider significant for application of this requirement. Any significant change in "amount or extent" of a contract item that is not covered by a modification must be explained with submission of the BCS-4 application for payment.

(i) Permitting cooperators to destroy or break up a practice

Authority to destroy or break up a practice or an identifiable unit carried out and/or cost-shared under the Black Creek Study Program must be obtained by the cooperator from the SWCD. Modifications to permit a cooperator to destroy or break up a practice or identifiable unit are required only when the practice to be broken up or destroyed was carried out and/or cost-shared under the BCSP.

Modifications to permit a cooperator to destroy or break up a practice or an identifiable unit are subject to the following:

(i) Clearly defined needs must be determined by the contracting officer prior to approving the destruction or breaking up of a practice or identifiable unit.

(ii) Planned land use of the area concerned with due regard to practical limitations.

(iii) The breaking up or destroying of a practice or identifiable unit must be followed by the installation of needed compensatory treatment which will preserve the effectiveness or identifiable units already installed on the operating unit.

(iv) The changed conservation treatment applied within the land use must meet technical standards and specifications applicable to the practice or identifiable unit required for protection of the land.

(v) The breaking up or destroying of a practice or identifiable unit is deemed essential, by the SWCD, to the most stable operation of the farm or land.

5.9 Reapplication of Practices that Fail or Deteriorate

Reapplication of practices that (1) initially fail to achieve desired results, or (2) deteriorate after achieving desired results, may be approved and cost-share paid, provided that:

(a) Reapplication is essential

(b) The specifications for the practice were met in the original application

(c) The failure or deterioration was due to conditions and circumstances beyond the control of the cooperator.

A cooperator cannot be required to reapply practices that fail or deteriorated because of conditions or circumstances beyond his control. When a practice fails or deteriorates because of conditions or circumstances within the control of the cooperator, he is in violation of the terms of the contract. When such a violation occurs, the District may permit the cooperator to reapply the practice that has failed or deteriorated without federal cost-sharing and therefore keep the remainder of his contract valid.

Each item for reapplying a practice shall be numbered the same as the original contract item suffixed with the letters "RA."

Unless a separate cost-share rate is established and approved, any repeat application will be at the same cost-share rate shown in the contract for the original application. For re-application use the contract modification Form BCS-4.

5.10 Reconstitution of Operating Units

If, for any cause:

(a) Two or more operating units, as constituted at the time a contract is entered into, are later combined, or

(b) One operating unit, as constituted at the time the contract is entered into, is later divided into two or more operating units, or

(c) Land is added to or deleted from an operating unit under a contract which significantly affects the plan of operations;

The operating unit shall be considered reconstituted, when an operating unit is reconstituted. The contract shall be modified in accordance with procedures prescribed by the SWCD.

5.11 Transfer of Land

For application of this section, acreage will be considered "trans-

ferred" if control of the acreage is lost by a cooperator for any reason. The term "transferee" means the cooperator who acquires control of the land.

When all or part, of an operating unit under a BCSP contract is transferred, the contract terminates with respect to the transferred acreage. If the transferee will not assume the obligations of the BCSP contract with respect to the transferred acreage, the transferor is subject to certain forfeitures and refunds.

The transferee may assume the obligations of the BCSP contract with respect to the transferred acreage.

The procedure to follow in transferring the rights and obligations of a BCSP contract from one cooperator to another is dictated by the extent of the acreage transferred and how the land will be operated after the transfer. For transferring land the transfer agreement BCS-5 shall be used, see Exhibit.

In addition to the description of the acreage transferred, all items, cost-shared and noncost-shared, to be carried out by the transferee shall be listed on the transfer agreement.

The transferee shall be furnished a complete copy of the contract which shall include a copy of all pertinent documents including modifications. The original copy of the executed transfer agreement shall be filed with the SWCD copy of the contract. Copies manually signed by both parties plus the contracting officer and the SWCD shall be furnished to the transferee and the transferor. Conformed copies shall be furnished for all other copies of the contract.

The financial and time limitations of a contract are not affected when all of an operating unit is transferred and will be operated as a separate operating unit.

To transfer all of an operating unit to be combined with another operating unit already under a contract,use the contract modification procedure.

5.12 Contract Termination

If all or a part of an operating unit is transferred by sale or otherwise, the contract terminates with respect to the acreage transferred. Acreage will be considered "transferred" if the control of the acreage is lost by a cooperator for any reason. A refund of cost-share payments for identifiable units carried out on the transferred acreage is required unless the cooperator assumes the obligations of the contract with respect to the rights and interests transferred.

Contracts expire at twelve midnight on the final date of the contract. If all of the identifiable units in the contract have not been carried out before the contract expires, the following shall apply:

(a) If the failure to carry out all of the identifiable units in a contract was due to circumstances beyond the control of the cooperator, a refund or adjustment of cost-share payments is not required.

(b) If the failure to carry out all of the identifiable units in the contract was due to circumstances within the control of the cooperator a refund or adjustment of all cost-share payments is required.

An on-site review of all items in a contract must be made at least 90 days before the final date of a contract. This review should be made with the cooperator. A record of the findings must be made on form BCS-9, annual contract status report, see Exhibit.

5.13 Contracts May Be Terminated by Mutual Consent If:

(a) For valid reasons, it is impractical for the cooperator to carry out the contract. Termination under this circumstance requires a refund of all cost-share payments that have been made to the cooperator.

(b) Encroachment for public purposes such as highway development, military installations, or municipal expansion have so altered the operating unit that the remaining portion of the operating unit unsuited for a practical operation.

Only that part of the contract that covers the acreage remaining after encroachment for public purposes may be terminated by mutual consent. Termination under this circumstances does not require a refund of cost-share payments.

(c) It is determined that the cooperator of the operating unit is under such physical or mental disability that it would not be reasonably possible for him to carry out the terms and conditions of the contract and that to require him to do so would work an undue hardship on him. In such cases, the contract may be terminated without recovery of cost shares with approval of the contracting officer and the SWCD.

Any notice terminating a contract shall state whether or not a refund or adjustment in cost-share payments will be required. The notice shall also provide that the SWCD will inform the cooperator of the amount of the refund or adjustment and how such a refund or adjustment is to be affected. To notify a cooperator of contract termination use BCS-10, see Exhibit.

5.14 Actions that Tend to Defeat the Purposes of a Contract

The following actions tend to defeat the purposes of the contract: Knowingly or negligently destroying or breaking up a conservation practice listed in the plan of operations, irrespectable of cost-share payments, unless prior approval in writing is given by the contracting officer to the destroying or breaking up under standards determined by the SWCD or SCS. Such actions by a cooperator on an operating unit while he has control thereof during the life of the contract shall constitute a violation of the contract.

5.15 Contract Violation

The cooperator shall agree by signing a contract to forfeit all rights to further cost-share payments or grants under the contract and to refund all cost-share payments or grants received thereunder, if the contracting officer determines that there has been a violation of the contract during the time the cooperator has control of the operating unit and that such violation is of such a nature as to warrent termination of the contract. The cooperator who signs the contract will be obligated to refund all cost-share payments.

The cooperator shall agree by signing a contract to make refunds of cost-share payments or grants received under the contract or to accept payment adjustments in the contract, if the contracting officer determines that there has been a violation of the contract during the time that the cooperator has control of the operating unit and that such violation is of such nature as to warrent termination of the contract. Payment adjustments may include decreasing the rate of a cost-share or deleting from the contract a cost-share committment or withholding cost-share payments earned but not paid. The cooperator who signs the contract will be obligated to refund cost-share payments.

A contract has been violated if the cooperator:

(a) Does not comply with all terms and conditions of the contract. This includes, but is not limited to, failure to carry out the plan of operations as scheduled failure to meet SCS Specifications in establishing practices. (A cooperator who failed to carry out a practice(s) in his plan of operations as scheduled will not be considered in violation if he promptly reschedules the practice(s) by modification).

(b) Without approval of the contracting officer and/or SWCD, destroys or breaks up a conservation practice established under the terms of the contract.

(c) Files a false claim.

All employees involved in the Black Creek Study shall furnish to the contracting officer any information they obtain that indicates a violation may have occurred. In every instance, the contracting officer is required to ascertain if a violation has occurred and if so, determine if a forfeiture, refund or payment adjustment or termination may be warrented. If a violation has occurrred and a forfeiture, payment adjustment, or termination may be warrented, the contracting officer shall see that the SWCD cooperator is informed of the details of the violation in writing.

The contracting officer shall make a narrative report to the SWCD on each case. The report shall include the information received by the contracting officer his findings of facts and determination.

If the SWCD approves the report of the contracting officer, and no violation has occurred, or if a violation has occurred but no forfeiture, refund, payment adjustment, or termination is required, no further action is necessary. A copy of the report of the contracing officer, approved by the SWCD, shall be filed in the SWCD office.

If a violation has occurred and a forfeiture, refund, payment adjustment or termination is required, efforts shall be made by the contracting officer to obtain a non-compliance agreement BCS-7, see Exhibit.

If an agreement is not made, a notice of violation shall be issued. The notice shall be on form BCS-8, notice of contract violation. This notice shall be forwarded to the cooperator by certified mail, return receipt requested. After a notice of contract violation, form BCS-8, has been issued the contract violations procedure outlined in the contract violations procedures section of the handbook shall be followed.

If a violation involves considerable money or a possible termination, of a contract, it would be advisable to confer with the attorney-in-charge or the EPA project officer. He may serve as the hearing officer.

5.16 Contract Violations Procedure

This section prescribes the regulations for determining whether a violation of a contract has occurred and for the effect and result of such violation. The SWCD reserves the right to modify, amend, revise, or supplement any of the provisions of this section at any time: provided, that such action shall not adversely affect any cooperator where determination or decision has been made and the cooperator has been officially notified thereof before such action is taken. No cost-share payment or cost-share shall be made pending the determination or decision as to whether a contract violation has occurred.

If the contracting officer receives information indicating that a violation of a contract may have occured but determines, without the issurance of a notice as provided in this section and with the approval of the SWCD, that no violation has occurred, or that the violation does not call for any forfeiture, refund, or payment adjustments, no further action shall be taken.

If the cooperator subject to a forfeiture, refund, payment adjustment, or termination agree in writing on a form prescribed by the SWCD, to accept such forfeiture, refund, payment adjustment or termination, no further proceeding under this section shall be undertaken. The contracting officer and the SWCD shall give approval to this agreement. The agreement shall specify the remaining obligations to the contract by both parties.

(a) If the SWCD believes, on information submitted by the contracting officer or otherwise, that a violation of a contract has occurred which would call for a forfeiture, refund, payment adjustment or termination under the provisions of this section, written notice thereof, on a form prescribed by the SWCD, shall be given to the cooperator signatory to the contract.

(b) Notice to a cooperator under this section may be shown by (1) a written statement by the contracting officer that the notice was personnally delivered to the cooperator; (2) a written statement by a cooperator ackowledged receipt of the notice; and (3) a post office return receipt (registered or certified mail) showing that the notice was delivered at the last address of the cooperator or showing that the notice could not be delivered to the cooperator at his last address because he had moved without a forwarding address. Under this section a cooperator will be considered to have received the notice at the time of personal receipt, or at the time of the return of an undelivered registered or certified letter.

(c) The notice shall set forth the nature of the alleged violation and shall inform the cooperator that he will be given an opportunity to appear at a hearing before the SWCD board if he files a written request for such hearing in the SWCD office not later than 30 days before the time he received the notice. The cooperator shall be notified in writing by the project administrator of the time, date and place set for the hearing. If the cooperator does not file written request for a hearing, or does not appear at the appointed time, he may still have an opportunity for a hearing. The board may, at their discretion, permit such cooperators to appear before them at another time.

(i) The hearing before the SWCD board shall be held at the time and place and on the date set forth in the notice of the hearing to the cooperator.

(ii) The hearing shall be conducted in the manner deemed most likely to obtain the facts relevent to the alleged violation. The SWCD board shall have full authority to confine the presentation of facts and evidence to pertinent matters and to exclude irrelevent immaterial, or unduly repetitious evidence, information or questions. In so doing, the SWCD board shall not be bound by the strict rules of evidence as required in courts of law. The hearing may be sworn at the discretion of the board. The hearing shall be public.

(d) The cooperator, or his representative, at the hearing shall be given a full opportunity to present facts and information relevent to the alleged violation and may present oral or documentary evidence. Statements and evidence may be submitted at the hearing by the contracting officer. Individuals not otherwise present at the hearing to give information or evidence may, at the discretion of the board, be requesting or permitted to give information or evidence. The board at its discretion, may permit witnessess to be cross-examined, including those individuals called by it.

(e) The board shall provide for the making of a record at the hearing as will enable it to make a summary of the testimony received at the hearing if the cooperator and the contracting officer agree. If the contracting officer feels that the nature of the case is such as to make a transcript desirable and if the cooperator requests such a transcript a reasonable period prior to the time that the hearing begins, a transcript of the hearing shall be made. If a transcript is desired only by a cooperator, he will be required to provide for its preparation and for the payment of expenses thereof. If a transcript is desired by both the contracting officer and the cooperator the cooperator will be required to pay only the expense of a copy of the transcript. The remainder of the expense will be paid by the SWCD.

(f) If, at the time scheduled for the hearing, the cooperator is absent and no appearance is made on his behalf, the board shall after a lapse of such a period of time as they may consider proper and reasonable, close the hearing, or may, at their discretion accept information and evidence submitted by others present for the hearing.

(g) In every case where a cooperator is sent a notice of an alleged violation pursuant to paragraph (d) of this section,

except where the cooperator agrees to the forfeiture, refund, payment adjustment or termination as provided in paragraph (c) of this section, the board shall furnish the contracting officer with a written report setting forth its findings, conclusions, and recommendations.

(h) The board may authorize or require the reopening of any hearing for any reason at any time prior to its determination.

(i) If the determination of decision is that the violation is of such a nature as to warrent termination of the contract, the determination or decision shall state that the contract is terminated and that all rights to further cost-share payments or grants received under the contracts shall be refunded. The determination or decision will state the amount of the refund and how payment may be accomplished.

(j) If the determination or decision is that the violation is of such a nature as not to warrent termination of the contract, the cooperator may be required to make a refund of cost-share payments or decision shall state the extent of refunds of cost-share payments or grants or payment adjustments. In arriving at the extent of the violation the board must determine (1) whether the violation was deliberate or within the control of the cooperator; (2) the effect on the program if no refund or payment adjustment is required; (3) the extent to which the cooperator benefited by the violation; (4) the effect of the violation on the contract as a whole; and (5) other pertinent considerations including the appropriateness and reasonableness of the refund or payment adjustment.

5.17 Compliance with Regulatory Measures

Cooperators who carry out conservation practices shall be responsible for obtaining the authorities, rights, easements or other approvals necessary to the carrying out and maintenance of the conservation practice in keeping with applicable laws and regulations. Cooperators shall save the SWCD harmless from any infringements upon the rights of others or from any failure to comply with applicable laws or regulations.

5.18 Appeals

Any cooperator may request the contracting officer to reconsider prior to the execution of the contract by the cooperator, any determination made by him affecting the contract except this may not include development of eligible conservation practices, cost-share rates and average costs. Such requests shall be in writing and shall be filed within 15 days after receiving notice of such determination. A cooperator shall be deemed to have received notice of the determination

if a letter, form, or other document has been mailed or delivered to him which discloses such determination. The contracting officer shall notify the cooperator of this decision in writing (by mailing or by delivery of the decision) within 30 days after the filing of the written request for reconsideration.

If the cooperator is dissatisfied with the decision of the contracting officer, he may within 15 days after receiving written notice of the decision file a written appeal with the SWCD Board. The SWCD Board shall notify the cooperator of its decision in writing (by mailing or by delivery of the decision) within 30 days after filing of the appeal. If the cooperator fails to request reconsideration of a determination by the contracting officer or fails to appeal from a decision of the contracting officer, within the 15 days period, the determination of decision of the contracting officer shall be final.

The contracting officer may submit statements or briefs, including a review of the case, to the SWCD Board.

Whenever the regulations in this section require the filing of a document, it is deemed filed when received, in the SWCD office.

5.19 Access to Operating Unit and Program Records

Any authorized representatives of the SWCD and U.S. EPA, for the purpose of ascertaining the accuracy of any of the representations made in or in connection with or leading up to any contract entered into hereunder and the entering into any contract of the performance of the terms and conditions of such contract shall have the right to enter the operating unit at any reasonable time in order to measure the acreage, to render technical assistance, to inspect the work undertaken under any contract and to examine any program records pertaining to the operating unit and the cooperator shall furnish such information relating to the operating unit as may be requested by authorized representatives of the Board.

5,20 Procedure for Individual Farm Contracts

The following procedure will be used for developing individual contracts.

(a) The individual cooperator will sign up as a cooperator with the, Allen County Soil & Water Conservation District. The basic agreement allows the District representatives to provide assistance.

(b) The District will assist the cooperator in developing a plan of operations, which will identify all conservation practices needed on the land. The plan will be approved by the U.S. EPA's project officer.

(c) The individual plan of operations will be valid from October 17, 1972 through September 30, 1977.

(d) On the basis of the plan of operations, the district will enter into a contract with the individual cooperators to provide cost-share assistance for the application of conservation practices on the land. The conservation practices to be applied will be outlined in the plan of operations giving the estimated cost-sharing amount to be provided by the district in the year the practice(s) will be installed. All payments will be made on certification by the Soil Conservation Service that the installation meets the technical guide specifications. Cost-sharing will be based on the percentage determined by the district, and approved by the U.S. EPA's project officer.

(e) Each conservation practice in the individual plan of operations will be considered a contract item and must be certified by the appropriate Soil Conservation Service representative before payment can be authorized. If the estimated contract item cost is equal to or exceeds $2500.00, the bidding procedure will be used as outlined in group contracting.

(f) If the cost of the contract item is equal to or exceeds $2500.00 the bidding procedure will be used, and a Soil Conservation Service representative will develop the plans and specifications for the work to be performed for the individual to advertise for a contractor. The design will be developed from field surveys and engineering design criteria established by the Soil Conservation Service, and approved by the U.S. EPA's project officer, before contractors are notified of bid opening date.

(g) Notification to contractors of bid openings will be by public advertisement.

(h) The individual farmer may request assistance from the district in preparing the advertisement to prospective bidders advising the contractor of the date to pick up their bid packet and also notify the contractor of the date of the bid opening and selection date of the successful bidder.

(i) A listing of potential bidders will be prepared and updated periodically by the Allen County Surveyors office, and the Allen County Soil & Water Conservation District.

(j) Notice to the prospective bidders will contain (bidders packet):

(i) A brief outline of the work

(ii) Estimated cost range

(iii) Bond requirement

(iv) Bid notice will be a minimum of fourteen (14) days from the time the bid notice goes out until the contract bids are open. The U.S. EPA's project officer will approve the bid before the contract is let

(v) A bond of 1-1/4 times the contract price will be required

(k) An SCS representative will be placed in charge of supervising the installation of all conservation practices in the contract.

(l) Upon completion and certification of the contract practice installation, the district will make payments based on the cost-sharing schedule, (sub-section 9.6) payment will not exceed the amount in the individual plan of operations.

(m) The individual cooperator will provide the district contracting officer with bills covering installation costs in order to receive cost-sharing payment.

5.21 Conservation Materials or Services

Conservation materials or services needed by cooperators to carry out their contracts will be obtained or contracted for by the cooperator.

5.22 Materials and Services, Inspection and Analysis

Conservation materials or services, used for installing practices to be cost-shared must meet the quality standards set forth the SCS Technical Guide.

5.23 Procedure for Group Contracting

The following procedure will be used for developing group contracts:

(a) The group members first will sign a cooperative agreement with the District, which allows the district representatives to provide assistance

(b) The district will then assist the group in developing a plan of operations which will identify all conservation practices needed on their land

(c) On the basis of this plan of operations, the district will enter into a contract with the group to provide cost-sharing assistance for the application of conservation practices on their land. These conservation practices will be outlined

in the plan of operations spelling out the estimated cost sharing amount to be provided by the District in the year the practice(s) will be installed. All payments will be made on certification by the Soil Conservation Service that the installation meets the technical guide specifications. Cost sharing will be based on the percentage determined by the District and applied to the actual cost not to exceed the SCS representative's estimate.

(d) The Soil Conservation Service will develop the plans and specifications for the work to be done for use by groups in advertising for a contractor. This design will be developed from field surveys and engineering design criteria established by the Soil Conservation Service, and approved by the U.S. Environmental Protection Agency before contractors are notified through local advertisements of the bid opening date. A list of responsible bidders will be prepared and updated periodically by the Allen County Surveyors Office and the Allen County Soil and Water Conservation District.

The group with assistance from the District, if requested, will prepare the bid advertisement and select the bid opening date. In the notice to the prospective bidders a brief outline of the work to be done and estimated cost ranges and a bond requirement will be stated. The individual or group will always provide the contractor with a minimum of fourteen (14) days notice from the time the bid notice goes out until the contract bids are open. The U.S EPA will approve the bid before the contract is let. The award of the contract will be made to the responsible bidder submitting the lowest responsive bid. The contractor who is selected to do the work will be required to provide a bond in the amount of 1-1/4 times the contract price. This bond will be payable to the respective individual or group, not to the District. A representative of the Soil Conservation Service will be placed in charge of supervising the installation of all conservation practices in the contract. Upon completion and certification of practice installation, the District will make payments based on the cost sharing rate set up in the plan of operations. Cost sharing will be based on actual cost not to exceed the engineers estimate.

Section VI
COST-SHARE

Cost-share incentives will be made to individuals and groups to encourage application of various conservation practice to the land.

6.1 Eligible Conservation Practices

The list of soil and water conservation practices for the BCSA are described on pages A-41 through A-46 of the work plan and are listed in Table A-10 of that document. These practices are eligible for cost-shares when carried out in combination as set forth in plans of operations for the primary purpose of protection against wind or water erosion and reducing or controlling agricultural related pollution, these are:

(a) Conservation Cropping System

Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

(b) Contour Farming

Farming sloping cultivated land in such a way that plowing preparing and planting, and cultivation are done on the contour. (This includes following established grades of terraces, diversions, or contour strips).

(c) Critical Area Planting

Stabilizing silt-producing and severely eroded areas by establishing vegetative cover. This includes wood plants, such as trees, shrubs, or vines, and adapted grasses or legumes established. (Does not include tree planting mainly for the production of wood products).

(d) Crop Residue Management

Using plant residues to protect cultivated fields during critical erosion periods.

(e) Diversions

A channel with a supporting ridge on the lower side constructed across the slope.

(f) Farmstead and Feedlot Windbreaks

A belt of trees or shrubs established next to a farmstead or feedlot.

(g) Field Border Planting

A border or strip of perennial vegetation established at the edge of a field by planting or by converting from trees to herbaceous vegetation or shrubs.

(h) Field Windbreaks

A strip or belt of trees or shrubs established to reduce wind erosion.

(i) Grade Stabilization Structure

A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include stream channel improvement, streambank protection, diversion, or structure for water control).

(j) Grassed Waterways

A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose of runoff from a field, diversion, terrace or other structure.

(k) Holding Ponds and Tanks

A fabricated structure or one made by constructing a pit dam or embankment for temporary storage of animal or agricultural wastes, associated runoff and waste water.

(l) Land Smoothing

Removing [illegible] irregularities on the land surface by use of special equipment.

(m) Livestock Exclusion

Excluding livestock from an area where grazing is not wanted.

(n) Livestock Watering Facility

A trough or tank with needed devices for water control to provide drinking water for livestock.

(o) Minimum Tillage

Limiting the number of cultural operations to only those that are properly timed and essential to produce a crop and prevent soil damage. (For this project moldboard plowing is not cost sharable).

(p) Pasture and Hayland Management

Proper treatment and use of pastureland or hayland.

(q) Pasture and Hayland Planting

Establishing and re-establishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. (Includes pasture and hayland renovation, does not include grassed waterway or outlet on cropland).

(r) Ponds

A water impoundment made by constructing a dam across a watercourse or a natural basin, or by excavating a pit or "dugout." (Such ponds do not include spring development or irrigation reservoirs).

(s) Protection During Development

Treatment based on a plan to control erosion and sediment during development for residential, commercial-industrial, community servies, transportation routes or utility uses.

(t) Recreation Area Improvement

Establishing grasses, legumes, vines, shrubs, trees, and other plants or managing woody plants to improve an area for recreation.

(u) Sediment Control Basins

A barrier or dam constructed across a watercourse or at other suitable locations to form a silt or sediment basin.

(v) Stream Channel Stabilization

Stabilizing the channel or a stream with suitable structures. (Includes 90,000 feet, fencing; 6,000 feet structural stabilization).

(w) Streambank Protection

Stabilizing and protecting banks of streams or excavated channels against scour and erosion by the use of vegegative or structural means.

(x) Stripcropping

Growing crops in a systematic arrangement of strips or banks on the contour to reduce erosion.

(y) Surface Drains

A graded channel for collecting excess water within a field. This does not include grassed waterway or outlet.

(z) Terrace, Gradient

An earth embankment or a ridge and channel constructed across the slope to a suitable opening and on an acceptable grade to reduce erosion damage and pollution by intercepting surface runoff and conducting it to a stable outlet.

(aa) Terrace, Parallel

An earth embankment or a ridge and channel constructed in parallel across the slope at a suitable spacing and acceptable grade to reduce erosion and pollution and provide a more farmable terrace system.

(bb) Tile Drains

A conduit, such as tile, pipe or tubing, installed beneath ground surface and which collects and/or conveys drainage water. The project goal is approximately 200,300 lineal feet which is needed for erosion and sediment control of surface drains and grassed waterways.

(cc) Tree Planting

Planting tree seedlings and cuttings.

(dd) Wildlife Habitat Management

Retaining, creating, or managing wildlife habitat for both upland and wetland.

(ee) Woodland Improved Harvesting

Systematically removing some of the merchantable trees from an immature stand to improve the conditions for forest growth.

(ff) Woodland Improvement

Improving woodland by removing unmerchantable or unwanted trees, shrubs, or vines.

(gg) Woodland Pruning

Removing all or parts of selected branches from trees to improve timber quality.

6.2 Basis for Cost-Sharing

Cost-sharing may be on the basis of (1) average cost, or (2) actual cost not to exceed a specified maximum cost as set forth in the Table A-10 of the work plan and current specifications for the practices including cost-sharing procedures, see Exhibit.

Each identifiable unit to be cost-shared must be clearly identifiable in the plan of operations (Form BCS-2).

6.3 Average Cost and Specified Maximum Costs

Average cost and specified maximum cost shall be reviewed annually and must be approved by the SWCD.

County average cost and specified maximum costs shall be reviewed for a twelve month period, and shall be approved no later than January 31 each year.

Necessary changes in average costs and specified maximum costs shall be approved as deemed necessary by the SWCD. Generally, changes shou not be made in average costs unless actual costs have increased or decreased by 10% or more.

6.4 Determination of Average Costs

The basic element in the determination of an average cost is the actual cost to cooperators. Data on actual costs shall be collected on a continuing basis, from cooperators, by SCS technicians and the project director. Actual costs data must be collected on a representative number of jobs on all eligible practices. Such data need not be collected on all jobs. In the determination of average costs, information from suppliers, land grant colleges, and other sources may be considered in addition to data collected from cooperators. All cost data used in determining average costs, must be on file in the office where the average costs are determined.

6.5 Specified Maximum Costs

When practices are to be cost-shared on an actual cost basis not to exceed a specified cost, a maximum amount to which cost-sharing will be eligible, shall be entered in the average cost column of the plan of operations for each identifiable unit of the practice.

The specified maximum cost shall be an amount not in excess of that considered by the SWCD to be a sound investment for the cooperator and the government, all factors considered.

6.6 Changing the Rate or Amount of Cost-Sharing

The SWCD will review cost-share rates annually and when if change affects practices not yet installed a contract modification will be needed to reflect the changes.

Section VII
PAYMENTS

7.1 Cost-Share

The procedure for cooperators to receive cost-share payment is as follows:

(a) The cooperator makes an application for cost-share when the work is completed. Application is made on Form BCS-5, see exhibit. At the same time, he submits the necessary bills, invoice or other materials as prescribed by the contracting officer. He completes and signs an in-kind or cash contribution report, SBA-363, see exhibit.

(b) The contracting officer notifies SCS that the work has been completed. SCS representatives then certify that work has been done as planned and according to standards and specifications.

(c) After the work has been certified by SCS, the contracting officer prepares a voucher for payment and submits it to the SWCD.

(d) The SWCD reviews the vouchers and approves them.

(e) The contracting officer then makes out and mails or delivers a check to the cooperator.

It is the responsibility of the producer to make application for any cost-share payment that is due him on or before June 30, of the year following the calendar year in which the identifiable unit was applied or installed on the land.

Cost-share payments may be made only after an identifiable unit is carried out. "Carried out" means applied on the land. Cost-share payments may not be made for unapplied materials, or services that partially complete an identifiable unit of a practice.

Cost-share payments may not be made for a completed identifiable unit that is dependent upon the performance of a practice that failed to meet specifications. For example, a livestock watering facility that is supplied by a pond, not meeting specifications, will not be eligible for cost-share. In cases of this nature, the cooperator must be informed by an explanation to be included on the Form BCS-7, see exhibit, issued as a result of the practice not meeting specifications.

Cost-share payments may not be allowed for any work performed prior to the date the contract is signed by the Cooperator.

Payments must be drawn in the names of the cooperator signatory to a contract.

7.2 Cost-Share Payments

Cost share payments shall be made at cost-share rates applied in the contract.

(a) Cost share payments are made for carrying out identifiable units and are conditioned upon approval of the certificate of performance and compliance by the SCS representative. Upon certification by SCS the cooperator shall submit on an approved form an application for payment to the SWCD.

(b) A cooperator is not eligible to receive cost-share payments under the program for an identifiable unit which was not or is not to be carried out under this program.

7.3 Cost-Share for Groups

Due to the generally more complex and costly nature of group projects, they will be considered as special projects and will be subject to written approval by both the project administrator and project officer of EPA. Special cost-share rates and amounts will be subject to review and approval by the EPA project officer.

7.4 Cost-Share Payments not Subject to Claims

Any cost-share payment, or portion thereof, due any cooperator hereunder shall be determined and allowed without deduction of claims for advances and without regard to any claim or lien against any crop, or proceeds thereof.

7.5 Filing of False Claims

No cooperator shall file a claim for a cost-share payment to which he knows he is not entitled under the provisions for the program, including claim for a cost-share payments not carried out or for eligible conservation practices carried out in such a manner that they do not meet the required specifications thereof, and the filing of any such claim shall constitutes violation of the contract.

7.6 Manner and Time of Cost-Share Payments

Cost-share payments shall be paid to the cooperator after he has carried out an identifiable unit of his plan of operations and arrangements therefor shall be made by the SWCD. Payments shall be made as soon as practicable after the identifiable unit is carried out and the extent of performance has been established. It shall be the responsibility of the cooperator eligible for cost-share payments to establish his claim to such payments. Cost-share payments for identifiable units carried out under the program will be made only upon application submitted on the form prescribed to the SWCD. Such application shall be filed within 90 days after the identifiable unit was carried out.

7.7 Payments Due Persons, Deceased, Disappeared, or Declared Incompetent

Death: Where any person who is otherwise eligible to receive a cost-share payment dies before payment is received, payment may be made upon proper application therefore, without regard to claims of creditors in accordance with the following order of precedence.

(a) To the administrator or executor of the deceased person's estate.

(b) To the surviving spouse, if there is no administrator of executor and none is expected to be appointed, or if an administrator or executor was appointed but the administration of the estate is closed (i) prior to application by the administrator or executor for such payment, or (ii) prior to the time when a check, draft or certificate issued for such payment to the administrator or executor is negotiated or used.

(c) If there is no surviving spouse, to the children of the deceased person in equal shares. Children of a deceased child or a deceased person shall be entitled to their parent's share of such payment, share and share alike. If there are no surviving children of a deceased child or such deceased person, the share of such payment which otherwise would have been made to such child of the deceased person shall be divided equally among the surviving children of the deceased person and the estates of any deceased child where there are surviving direct descendents.

(d) If there is no surviving spouse and no direct descendent, payment shall be made to the father and mother of the deceased person in equal shares, or the whole thereof of the surviving father or mother.

(e) If there is no surviving spouse, or direct descendent, and no surviving parent, payment shall be made to the brothers and sisters of the deceased person on equal shares, children of a deceased brother or sister shall be entitled to their parent's share of the cost-share payment, share and share alike. If there are no surviving direct descendants of the deceased brother or sister of such deceased person, the share of the payment which otherwise would have been made to such brother or sisters shall be divided equally among the surviving brothers or sisters of such deceased person and the estates of any deceased brothers or sisters where there are surviving direct descendants.

(f) If there is no surviving spouse, direct descendants, parent, or brothers or sisters of their descendants, the payment shall be made to the heirs-at-law in accordance with the law of the state of domicile of the deceased person. If any person who

is entitled to payment under the above order of prescedence is a minor, payment of his share shall be made to his legal quardian, but if no legal guardian has been appointed, payment shall be made to his natural guardian or custodian for his beneift, unless the minors share of the payment exceeds $1,000.00 in which event payment shall be made only to his legal guardian. Any cost-share payment which the deceased person could have received may be made jointly to the persons found to be entitled to such payment or shares thereof under this section. A separate check may be issued to each person entitled to share in such payment.

7.8 Disappearance

(a) In case any person otherwise eligible to receive a cost-share payment disappears before receiving payment, such payment may be made upon proper application therefore, without regard to claims or creditors to one of the following in the order mentioned:

(i) The conservation or liquidator of his estates, if one be duly appointed

(ii) The spouse

(iii) An adult son or daughter or grandchild for the benefit of his estate

(iv) The mother or sister for the benefit of his estate

(v) An adult brother or sister for the benefits of his estate

(vi) Such person as may be authorized under state law to receive payment for the benefit of his estate.

(b) A person shall be deemed to have disappeared if (i) he has been missing for a period of more than 3 months, (ii) a diligent search has failed to reveal his whereabouts, and (iii) such person has not communicated during such period with other persons who would be expected to have heard from him. Evidence of such disappearance must be presented to the SWCD in the form of a statement executed by the person making the application for payment, setting forth the above facts, and must be substantiated by a statement from a disinterested person who is well acquainted with the person who has disappeared.

(c) Incompetency: Where any person who is otherwise eligible to receive a cost-share payment is adjudged incompetent by a court of competent jurisdiction before payment is received, payment may be made, upon proper application therefore, with-

out regard to claims of creditors to the guardian or committee legally appointed, payment, if not more than $1,000.00 may be made without regard to claims for creditors to one of the following in the order mentioned for the benefit of the incompetent person:

(i) The spouse

(ii) An adult son, daughter or grandchild

(iii) The father or mother

(iv) An adult brother or sister

(v) Such person as may be authorized under state law to receive payment for the incompetent.

(d) Application to Heirs: In case any person entitled to apply for a cost share payment pursuant to the provisions of this section, dies, disappears, or is adjudged incompetent, as the case may be, after he has applied for such payment but before payment is received, payment may be made upon proper application therefore, without regard to claims or creditors to the person next entitled thereto in accordance with the order of precedence set forth herein.

(e) Definitions: As used in this subsection, the term "person" when relating to one who dies, disappears, or becomes incompetent, prior to receiving payment, means an individual cooperator who is due a cost-share payment pursuant to these regulations. "Children" shall include legally adopted children who shall be entitled to share in any cost-share payment in the same manner and to the same extent as legitimate children of natural parents. Brother or sister when relating to one who, pursuant to the regulations, is eligible to apply for a cost-share payment which is due a person, who dies, disappears, or becomes incompetent prior to the receipt of such payment, shall include brothers and sisters of the half blood who shall be considered the same as brothers and sisters of the whole blood.

7.9 Successors in Interest

If during the contract period all or a part of the right and interest of any cooperator signatory to the contract in the operating unit is transferred by sale or otherwise, the contract shall terminate as to such cooperators with respect to the acreage which has been transferred. In the event of such termination the cooperator whose right and interest is transferred shall forfeit all rights to further cost-share payments or grants made to him under the contract with respect to such acreage unless the transferee who acquires his right

and interest in such acreage is or becomes a party to a contract which will assume all obligations of the cooperator under, the contract.

The contract shall remain in full force and effect in accordance with the original terms and conditions of the contract with respect to the right and interest remaining to the cooperator. The contract may be modified by the contracting officer and the cooperator signatory to the contract, to reflect the changes, if any, brought about by the transfer, in the event necessary modifications cannot be agreed to with the contracting officer. The cooperator shall refund all cost-share payments or grants theretofore made to him with respect to his remaining right and interest in the operating unit and to the cooperator in the contract. If this refund occurs, the cooperator would have no further rights or obligations under the contract.

Section VIII
RESEARCH PROCEDURES

This section sets forth the basic field and laboratory analytical procedures to be followed in the project described in this document and in the plan of work Environmental Impact of Land Use on Water Quality (EPA-G005103). It is supplemental to rather than a replacement for the basic discussion of that document.

The laboratory and field procedures described in this section represent those it is believed will be most appropriate to the work to be carried out in the project. For example, laboratory procedures described in Section 8.4 are believed to be those most appropriate to the concentrations of particular substances expected to be found in the samples collected on this project. If information developed during the course of the project reveals that initial estimates were not correct, changes in procedures and techniques may have to be made to take into account the unexpected results. In that case, this handbook should be considered a guide rather than a definitive statement which is subject to neither change nor deviation.

Already, some changes in the basic thrust of the study have been considered. For example, the initial objective of the biological monitoring program was to assess the effects of land treatment practices on the biota; however, as work has progressed, the effects of the biota on the watershed have become very interesting. A surprising abundance and diversity of fish have been identified in the various tributaries of Black Creek. This observation is interesting from a biological standpoint, and changes in these populations will no doubt be recorded during the course of the project. The effects of the fish on the watershed and on the sampling process are particularly interesting also. During normal to low flow periods, the fish become concentrated in pools. These pools are often located below bridges where the samples are most often collected. Thus, samples taken during low flow periods were found to contain unrealistically high levels of turbidity due to activity of fish and of muskrats. Furthermore, the activity of the muskrats along the stream banks may have a profound influence on bank stability and erosion problems within the ditches. Consequently, an effort will now be made to determine both the effects of the watershed on the biota and the effects of the biota on the watershed and sampling methods employed.

Sampling is, of course, a fundamental problem in any monitoring program of the type planned for Black Creek. At the present state of the art, quantitative data will certainly not be as accurate as could be desired. The data collected will, however, be precise enough so that it is useful for comparison of results before and after treatment. Efforts are being made to obtain a useable automated sampling device.

Sections 8.1 and 8.2 set forth a summary of the basic questions being investigated during this project and the basic techniques that are being employed. A more complete discussion of these factors is contained in the work plan.

8.1 Goals of the Project Research

The following questions are identified for study in the Black Creek Project:

(a) Can a concentrated application of land treatment achieve a desired reduction of sediment in the Maumee Basin and Lake Erie?

  (i) What is the estimated cost?
  (ii) Can cost be accurately correlated with improvement in water quality?

(b) What is the relationship between sedimentation and the nutrients that accelerate euthophication?

  (i) Is the phosphorus composition of the colloidal sediment typical of the Maumee Lake Plain significantly higher than sediment containing larger amounts of sand and silt?
  (ii) What is the contribution of erosion and sediment transport from various soil types to NO_3 concentrations of runoff waters?
  (iii) What is the availability of phosphorus and nitrogen in runoff and stream waters to algae?
  (iv) Are nitrogen and phosphorus liberated from or absorbed by sediment over time?

(c) What is the relative importance of raindrop energy to runoff in detaching soil material for transport in Maumee Basin soils? What is the relationship of quantity of surface flow to detachment and transport?

(d) What are the contributions of various types of erosion (i.e. sheet, gulley, ditch bank, etc.) to sediment load?

(e) What are the effects of the project on biological components of the Black Creek Watershed? Conversely, what are the effects of the biota on erosion?

(f) What kind of program could be carried out on a basin-wide basis to convince individual landowners to apply needed conservation practices?

  (i) What are the attitudes toward the environment and conservation?
  (ii) What are the key factors that lead to a determination to participate in the project?

8.2 Techniques for Study

The techniques for study of these questions and the applications of these methods to the Black Creek project are outlined below.

(a) An accelerated program of land treatment will be carried out in accordance with the procedures outlined in the preceding sections of this handbook with conservation practices designed in accordance with the Universal Soil Loss Equation.

(b) Monitoring of Black Creek and its tributaries for various parameters will be carried out. Data collected will be in the following categories:

(i) Surface and Subsurface water samples
(ii) Rain water samples
(iii) Water stage recorder data
(iv) Recording raingage data
(v) Field notes

(c) Laboratory analysis of the samples will be performed to measure:

(i) Organic Carbon
(ii) Phosphorus
(iii) Nitrogen
(iv) Calcium
(v) Magnesium
(vi) Sodium
(vii) Potassium
(viii) Heavy metals
(ix) pH, conductivity, dissolved oxygen, alkalinity

(d) Additional laboratory work will be done to study the equilibria of nitrogen and phosphorus in sediment.

(e) A series of experiments on trial plots using simulated rainfall will be conducted and the results analyzed to determine:

(i) The relative importance of raindrop energy and runoff energy in soil detachment and transport.
(ii) The effects of various cultural practices on erosion and sedimentation.
(iii) the effects of winter cover crop on erosion and sedimentation.
(iv) The effects of conservation tillage systems on erosion and sedimentation.

(f) A computer simulation model will be developed based on data collected in the project and utilizing the Universal Soil Loss Equation in an attempt to relate model coefficients to physical constants.

(g) Biological components of the watershed will be studied, primarily fish and insect life with general surveys being undertaken of other aspects of the biota.

(h) A sociological study will be conducted aimed at measuring the potential effectiveness of:

(i) Legislation
(ii) Education
(iii) An incentive program

in securing the cooperation of landowners in Black Creek Watershed and the Maumee Basin in a program of improvement of water quality through reduction of erosion.

8.3 Monitoring (data collection)

Data that are presently being collected can be classified into the following categories:

(a) Water samples from:

(i) Surface flow
(ii) Subsurface flow
(iii) Rainfall simulator plots

(b) Rain water samples

(c) Water stage recorder data

(d) Recording raingage data

(e) Field notes

8.3.1 Surface Flow

Sampling will be accomplished on the Maumee River, St. Joseph River, St. Mary's River, Black Creek and its tributary drains, and Wann Drain, which collects runoff from a check area immediately to the east of the Black Creek Watershed.

The rivers will be monitored to determine chemical and sediment concentrations using hand collection techniques according to procedures enumerated in Techniques of Water Resources Investigations of the United States Geological Survey, Book 3, Chapters C1, C2 and C3. Sampling sites will be on the St. Joseph and St. Mary's Rivers above Ft. Wayne and the Maumee River below Ft. Wayne. Reasons for the selection of these sites are (1) to supplement USGS data, (2) to isolate the sediment and chemical load contribution of Ft. Wayne, and (3) to study in particular the St. Mary's River which before entering Ft. Wayne drains mostly agricultural land. Samples to be used will be selected from the Inter-Agency Report "catalogue" (Federal Inter-Agency Sedimentation Project Report, 1966). Use of standard equipment and techniques will allow for a more reasonable comparison of data collected at these and other points in the Maumee Basin by other agencies.

Monitoring techniques for Black Creek and its tributary drains and the Wann Drain will differ from those used on the rivers because of the intermittent nature of these streams and the relatively short time to peak flow for the discharge hydrographs. For these reasons, strategically placed pumping sampler (PS-69) as developed by the Federal Inter-Agency Sedimentation Project will be used to automatically collect suspended sediment and chemical samples from the flowing streams. In addition, these samples will be supplemented by hand collected samples at intermediate and secondary sites throughout the Black Creek Watershed and the drainage area for the Wann Drain.

Samples to be collected by the automatic pumping samplers will be taken from the suspended load portion of the stream discharge using a float device. Comparison of the sediment concentration will be made to determine what correction factor if any will be necessary to apply to the singular point values.

Presently fourteen active surface water quality monitoring sites are in operation in the Black Creek Watershed and the drainage area connected with Wann Drain. Seven of these sites are also control sections of a stream or reservoir at which discharge measurements will be made. At the control sections, the surface stage measurements are continuously monitored using pressure-actuated stage recorders. The control sections on the steams have been improved by installing low flow weirs either constructed from sheet piling or steel plating. Calibration of stage with discharge will be accomplished using standard stream gaging equipment and techniques.

For each hand sample, two 500 ml. aliquots of discharge are collected at each site. One 500 ml. aliquot is frozen unfiltered immediately on return to the field laboratory located within the confines of Black Creek Watershed. About 200 ml. of the other aliquot is filtered through a 0.45 u pore-sized, acid (0.1N HCl) rinsed filter before being frozen. The remainder is used to determine the pH, dissolved oxygen, turbidity, and alkalinity if these parameters have not already been determined by the sampling sites.

In addition to the above surface water sites, several more will be installed at point pollution sources in the watershed and on sediment collection basins as they are constructed.

8.3.2 Subsurface Flow

Extensive subsurface drainage systems have been installed in the Maumee Basin to make the heavy, relatively poorly drained soils of the basin suitable for agriculture.

Subsurface flow will be monitored for chemical and sediment discharge using PS-69 automatic samplers. A minimum of three subsurface drainage systems which drain representative soil groups in the basin will be selected. Pumping facilities near the present outfalls are needed to alleviate backwater problems. Pumps to provide temporary storage of discharge will be calibrated so that a strip chart record of the pumping cycle will then provide a measurement of discharge.

Water samples will be treated similar to the surface flow samples described in the previous section.

8.3.3 Simulated Rainfall Plot Samples

Three sets of samples are collected from each Rainulator test site for:

(a) Nutrient analysis

(b) Determination of total sediment and its physical composition.

(c) Detailed phosphorus analysis

The samples for the first two of these uses are treated in the same manner as has been described in Section 8.3.1. Samples for detailed phosphorus analysis are bulk runoff samples amounting to four liters per individual test storm.

The water applied during the operation of the rainfall simulator is determined from samples from small aluminum channels placed diagonally across each plot. Runoff is recorded by a water level recorder on a small calibrated flume. Samples for sediment and nutrient analysis are collected by a sampling slot on a small rotating wheel. A more detailed description of the operation of the rainfall simulator is contained in Appendix 9.7.

8.3.4 Rainwater Samples

There are two operational rain water quality monitoring sites. Rain is collected and stabilized chemically. Samples are extracted and frozen for return to Purdue for analysis for nitrogen, phosphorus, sulfer and pH.

8.3.5 Water Stage Recorders

The water stage recorders, the use of which was described in Section 8.3.1, are gas operated units which measure the water stage by noting the pressure required to allow a bubble of CO_2 gas to escape. By use of calibrated control sections in streams or reservoirs, the recorded water stages can be related to discharge.

8.3.6 Recording Raingages

A relatively dense network of recording raingages has been established in such a way that neither natural nor man made features will interfere with the catch of the gages. The network has been established to provide data on the amount, intensity and areal distribution of precipitation.

Data is interpretable in five minutes intervals. Ten gages have been established on the 12,000 acre watershed. All ten will be operated

during the spring, summer, and fall when intensive thunderstorms are most likely. During the colder months, when precipitation has a more uniform areal distribution, the number of gages in operation is reduced. At least two gages will be operated in the winter and they will be prepared for full-winter operation including the collection of snow.

It is desirable to have shielded gages; however, it is not believed that the additional precision obtainable with shielded gages is necessary for the objectives of this project, particularly when it is considered that many individual landowners find the bulky shield mechanism objectionable when it is located near farm buildings or residences and are much less willing to give permission for the installation of a shielded raingages.

Calibration of each gage is checked after installation. It will be rechecked annually. Servicing of the gages is on a four to five day schedule. This service frequence provides good timing accuracy.

When the gages are serviced, charts are removed and sent to Purdue. Daily rainfall amounts for each gage are recorded.

8.3.7 Field Notes

The Purdue project coordinator is responsible for preparation of a detailed set of field notes. Although these notes are not of quantitative use, they are extremely useful for explaining anomalies in data that may result from extremely localized unusual weather or field conditions.

8.4 Laboratory Analysis

Water quality samples collected from the systems outlined in the preceding section will be analyzed at the Purdue Field Laboratory at the town of Harlan and in the Water Quality Laboratory established in the Agronomy Department at Purdue University. Analyses of samples are as outlined on Figures 8-1, 8-2, and 8-3. Basically, analyses for suspended solids, N components, P components, and organic carbon will be emphasized. These indicies of water quality were selected for the following reasons:

(a) Suspended solids is the basic parameter which will be used in this study to assess decreases in sediment loads in streams through use of soil conservation practices. Suspended solids lower water quality and usefulness of water resources by increasing the cost of purifying drinking water, decreasing desirability of water for recreation, interfering with food supply and reproduction in some game fish, promoting siltation of lakes, reservoirs, harbors, etc., and causing excessive wearing of metal parts in hydroelectric generating plants.

(b) Nitrogen content of water is important because nitrate in drinking water may impair the health of infants and ruminant livestock at concentrations greater than 10 ppm NO_3-N (USPHS standard). In addition, available forms of N such as ammonium and nitrate may promote excessive growth of algae and aquatic weeds (eutrophication) in surface waters when concentrations exceed about 0.5 ppm of N. It is important to measure the amount of nitrogen in the sediment phase because the N may be released to the water phase by microbial activity.

(c) Measurement of the phosphorus components in water samples is necessary because P has been identified as the element most often limiting algae growth in aquatic environments. Therefore, any influx of P may promote luxurous growth of algae. Although dissolved forms of P are most available to aquatic plants, it is mandatory that the P content of sediment be determined to estimate the potential size of the P source which could be liberated to the water phase.

(d) Organic carbon is a useful water quality parameter from several standpoints. The level of dissolved organic C provides an index of the trophic state of the water, indicates the size of the energy pool available to heterotrophic aquatic microorganisms, and provides information on the source of contamination, i.e. agricultural runoff or sewage discharge.

In addition, analyses for water temperature, dissolved oxygen, turbidity, pH, and alkalinity will be made at the time of sampling or immediately following sampling. Periodic measurements of K, Ca, Mg, Na, organochlorine pesticides, and selected heavy metals will be made on some samples to determine if any unusual conditions exist within the watershed. Follow-up samples will be taken if some unusual concentrations of the above listed elements or compounds are detected.

Methods to be employed are those specified in the Environmental Protection Agency publication Methods for Chemical Analysis of Water and Wastes published in 1971 or those in the following section of this handbook. Methods were chosen on the basis of those which are most suitable from the standpoints of percision, accuracy, and efficiency for the range of concentrations, expected in the watershed samples. All methods were evaluated for suitability prior to adoption in the laboratory.

8.4.1 Laboratory Methods

The following are laboratory methods currently in use at the Water Quality Laboratory in the Purdue University Agronomy Department.

8.4.1.1 Nitrogen

(a) Total soil nitrogen

1. Place 200 mg. soil samples (<100 mesh) into clean, dry Folin-Wu digestion tubes.

2. Add 1.1 g. of Kjeldahl catlyst mixture (Kjeldahl spatula).

3. Add 3 ml. of concentrated H_2SO_4 and swirl to mix.

4. Place digestion tubes into aluminum block preheated to 350°C. and place small glass funnels in the mouth of the tubes.

5. Heat samples at maximum setting on hot plate for 3 hours after digest clears.

6. Remove and cool.

7. Dilute to 50 ml. with deionized water and mix with a vortex mixer.

8. Transfer an aliquot of diluted digest containing from 0.2 to 0.5 mg. of N to a 100 ml. distillation flask without side arm.

9. Add 15 ml. of 10N NaOH through funnel on distillation apparatus.

10. Distill into a 50 ml. Erlenmeyer flask which contains 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask is collected).

11. Titrate the distillate with sulfuric acid (standardized) to a pale grey.

(If material containing <.2%N are analyzed, a soil sample equivalent to 0.2 to 0.5 mg. N is digested. Samples with low N are not diluted but are transferred quantitatively to a distillation flask, using deionized water to rinse the digestion tube.)

(b) Inorganic Nitrogen-Water

Ammonium:

1. Pipette a 25 ml. aliquot of filtered water in a 100 ml. distillation flask with side arm.

2. Add 0.2 g. ignited MgO (MgO spatula).

3. Distill into a 5 ml. Erlenmeyer flask which contains 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask is collected).

4. Titrate the distillate with standardized sulfuric acid to a pale grey.

Nitrate:

5. To the sample above previously treated with MgO add 0.2 g. of Devardas Alloy (D.A. spatula).

6. Distill and titrate as before.

(25 ml. deionized water will be used as a blank).

(c) Total Nitrogen - Water

Filtered Water:

1. Pipette 20 ml. of filtered water into a digestion tube.

2. Add 200 mg. of reduced iron and 0.3 ml. (5 drops) of concentrated sulfuric acid.

3. Evaporate the sample (to remove water) in the oven overnight at 105°C.

4. Remove and cool.

5. Add 3 ml. of concentrated sulfuric acid and heat sample to a gentle boil with the funnels on for 15 minutes in the aluminum block in the hood.

6. Remove, cool, and add 1.1 g. of Kjeldahl catalyst mixture (Kjeldahl spatuala).

7. Swirl to mix and put on funnel.

8. Digest at maximum heat on the hotplate in the hood 90 minutes past time of clearing of digest.

9. Remove, cool and add 10 ml. of deionized water. Mix with a vortex mixer.

10. Transfer sample to distillation flask without side arm.

11. Add 15 ml. of 10N NaOH through funnel on distillation apparatus.

12. Distill into a 50 ml. Erlenmeyer flask which contains 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask is collected).

13. Titrate the distillate with standardized sulfuric acid to a pale grey.

Unfiltered Water:

Repeat the above procedure with unfiltered water.

(20 ml. of deionized water will be used as a blank).

(d) Inorganic Nitrogen - Soil

Ammonium:

1. Place 20 g. of soil into a 250 ml. Erlenmeyer flask.

2. Add 100 ml. of 2N KCL.

3. Stopper and shake for one hour.

4. Let stand briefly.

5. Transfer a 20 ml. aliquot of the solution into a distillation flask with side arm using a wide mouth pipette.

6. Add 0.2 g. ignited MgO (MgO spatula).

7. Distill into a 50 ml. Erlenmeyer flask which contains a 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask) is collected.

8. Titrate the distillate with standardized sulphuric acid to a pale grey.

Nitrate:

9. To the sample above previously treated with MgO, add 0.2 g. of Devardas Alloy (D.A. spatula).

10. Distill and titrate as before.

(20 ml. of 2N KCL will be used as a blank).
ug N/4=ppmN/g soil

(e) Catalysts and Reagents

Devarda's Alloy:

1. Ball mill 1 lb. of commercial grade Devarda Alloy for at least 18 hours.

More than 90% should be <300-mesh.

Kjeldahl Catalyst:

1. Grind 100 g. of potassium sulfate in a mortar and pestle to a coarse powder.

2. Grind 10 g. of copper sulfate in a mortar and pestle to a powder.

3. Mix 1. and 2. in a mortar and pestle.

4. Add 1 g. of selenium to 3. and mix with a mortar and pestle till well mixed.

5. Repeat above until supply is sufficient.

Boric Acid - Indicator Solution:

1. Dissolve 20 g. of pure H_3BO_3 in about 700 ml. of hot water, and transfer the cooled solution to a 1 liter volumetric-flask containing 200 ml. of ethanol and 20 ml. of a mixed indicator solution prepared by dissolving 0.330 g. of bromocresol green and 0.165 g. of methyl red in 500 ml. of ethonol.

2. After mixing the contents of the flask, add approximately 0.05 N NaOH cautiously until a color change from pink to pale green is just detectable when 1 ml. of the solution is treated with 1 ml. of water.

3. Then dilute the solution to volume with water and mix it thoroughly.

Ignited MgO:

1. Heat heavy MgO in the electric muffle furnace at 600° to 700° for 2 hours.

2. Cool the product just enough so that it will not crack a desiccator.

3. Cool to room temperature in a desiccator containing KOH pellets.

4. Store in MgO bottles.

Standardization of Sulfuric Acid for Kjeldahl Distillation:

1. Add 2 ml. of concentrated sulfuric acid to 18 l. deionized water in a carboy and mix thoroughly.

2. Make a 0.01 N THAM standard by weighing accurately a 1.12114g. of THAM and dissolving it in a one liter volumetric flask with deionized water.

3. Pipette 5 ml. of 0.1 N THAM, into a 50 ml. Erlenmeyer flask containing 5 ml. of boric acid - indicator solution.

4. Titrate to the endpoint using the micro burette with the sulfuric acid to be standardized.

Normality of acid = (normality of THAM) x (ml. of THAM / (ml. of acid).

ug of nitrogen/ml. of acid = (normality of acid) x 14,000.

8.4.1.2 Phosphorus

Phosphorus is measured through the use of a spectrophotometer w is callibrated daily in the Purdue Laboratory utilizing the fol calibration procedures:

25 ml. final volume:

(1) Add from 1 to 10 ml. of 2 ppm. phosphorus solution to 50 ml. digestion tubes.

(2) Add deionized water to 20 ml.

(3) Add 5 ml. of Murphy-Riley Ascorbic Acid solution.

(4) Mix with vortex mixer.

(5) Read absorbance after 10 minutes at 880 nm.

(6) Range:

ml. of 2 ppm P	ppm of P in tube
1	0.08
2	0.16
3	0.24
4	0.32
5	0.40
6	0.48
7	0.56
8	0.64
8	0.72
10	0.80

50 ml. final volume:

(1) Add from 2-20 ml of 2 ppm. phosphorus solution to 50 ml. digestion tubes.

(2) Add deionized water to 40 ml.

(3) Add 10 ml. of Murphy-Riley/Ascorbic Acid solution.

(4) Mix with vortex mixer.

(5) Read absorbance after 10 minutes at 880 nm.

(6) Range:

ml. of 2 ppm P	ppm. of P in tube
2	0.08
4	0.16
6	0.24
8	0.32
10	0.40
12	0.48
14	0.56
16	0.64
18	0.72
20	0.80

(a) Soluble Water Phosphorus

1. Pipette 20 ml. of filtered water into a digestion tube.
2. Add 5 ml. of Murphy-Riley solution containing ascorbic acid.
3. Mix with a vortex mixer and read absorbance at 880 nm after 10 minutes.

(b) Total Phosphorus

Filtered Water:

1. Pipette a 20 ml. aliquot of water into a digestion tube.
2. Add 5 drops of concentrated sulfuric acid and evaporate in an oven at 105° C. overnight.
3. Remove and cool.
4. Add 1 ml. of perchloric acid with a pipette.
5. Put on funnel and digest for 15 minutes at 205°C. in the aluminum block in the perchloric acid hood.
6. Cool and add deionized water to a total volume of 30 ml.
7. Neutralize with 5 N NaOH using 1 drop of p-nitrophenol (0.25% solution) as an indicator.
8. Add 10 ml. of Murphy-Riley solution with ascorbic acid.

9. Bring to volume, mix with a vortex mixer, and read the absorbance at 880 nm after about 10 minutes.

Unfiltered Samples:

The procedure is the same for unfiltered samples with the exception that digestion in the aluminum block in the perchloric acid hood should continue for 30 minutes rather than 15.

(c) Murphy-Riley Solutions

For 19 liters stock solution:

1. Add 555 ml. of concentrated sulfuric acid to about 4000 ml. of deionized water in a 12 liter carboy. Allow to cool after swirling.

2. Dissolve 48 g. of ammonimum molybdate in about 1000 ml. of deionized water.

3. Dissolve 1.097 g. of antimony potassium tartarate in about 1000 ml. of deionized water.

4. Transfer 2. and 3. to 1. Rinse beakers with deionized water and dilute to 10 liters in the carboy.

Ascorbic-Acid Solution:

1. Mix daily as needed.

2. Add 4.22 g. ascorbic acid to 1 liter of Murphy-Riley Stock Solution and mix.

3. Clean tubing and jar daily when in use.

.4.1.3 Organic Carbon

Organic carbon in filtered and unfiltered samples is determined by a Dohrman Envirorotech DC-50. Organic Carbon Analyzer in accordance with the instruction manual furnished with the instrument. Specifically an acidified 30 ue water sample is injected into a boat containing MnO_2. The boat is moved to a 90° vaporization zone where water, carbonates, and volatile organic compounds are removed. Volatile organics are trapped on a porapak chromatographic column and subsequently back-flushed from the column and estimated as methane -C after reductive pyroloysis.

The boat is then moved to the pyrolysis zone (950°C) where residual organic C is pyrolyzed under reducing conditions and methane is liberated. Methane is determined by a flame ionization detector and the C concentration in the sample is calculated by integration of the methane release peak and the C content is displayed in digital form. The instrument has a range of 0-2000 ppm organic C and a precision of

± or ± 2% whichever is greater.

8.4.2 Fractionation of N and P in Detailed Laboratory Studies

An important part of the work plan for this project is directed at chemical fractionation of N and P components in sediment-water systems and elucidation of relationships between the forms of these nutrients. This phase of the study will allow interpretations to be made based on monitoring data.

It is widely known that algae and non-rooted aquatic weeds derive their nutrients from those present in a dissolved state in the water in which the plants are growing. If there were not sources for replenishment of dissolved N or P the plants would utilize all that was present and their growth rate would become zero. In most aquatic systems, however, suspended or floculated sediment (eroded soil particles) is present to release nutrients to the water phase. Thus, an equilibrium normally exists between soluble nutrients and those associated with the sediment phase. During nutrient depletion of the water phase, N and P are liberated from sediment, whereas the sediment may serve as a sink for nutrients during nutrient enrichment of water. Nutrients may be incorporated into sediments by absorptions, electrostatic attraction, precipitation, or biological immobilization.

If we are to determine the impact of agricultural erosion, subsurface drainage, and runoff water upon water quality, it is not enough to measure total nutrient loads derived from agriculture. We must know the forms of nutrients transported, the relationships between forms of nutrients (equilibria) and the availability of various nutrient forms to aquatic life. This study, therefore, attempts to collect some of the information for the soils of the Black Creek Watershed realizing that a large number of soil, land management, and hydrologic factors ultimately control nutrient transport and subsequent reactions in agricultural watersheds.

The outline in Figure 8-4 sets forth the procedures to be followed to accomplish study objectives. Samples of runoff from rainulator plots have been collected, frozen and stored. These samples represent fertilized and unfertilized plots of our soil types representative of soils in the watershed. The runoff samples were taken at varying times during the course of two, 2-1/2 inch rainstorms applied to each plot. Runoff samples will be thawed at room temperature and subjected to chemical and physical fractionation according to the scheme outlined in Figure 8-4.

The data obtained from the analyses outlined in Figure 8-4 will be utilized in two ways. First, an attempt will be made to relate total nutrient transport in the various forms to soil and fertility factors present at each experimental site. Secondly, correlation techniques will be used to establish relationships between the parameters measured for each soil type and for all soils considered together. After the relationships are established for surface runoff, samples of water will

be collected within the Black Creek Watershed and from the Maumee River to determine if similar nutrient equilibria between sediment and water exist. Of particular interest with these later samples is determination of the equilibrium phosphorus concentration (EPC). The EPC is determined by equilibrating the sediment with phosphorus solutions of varying concentrations and calculating the level of solution P at which neither sorption of added P or desorption of sediment P occurs. The EPC is an important parameter of sediments because it can be used to predict sorption or release of P when sediment comes in contact with water of varying P levels.

The availability of nutrients in sediment water systems to algae will be evaluated by a bio-assay technique in which a two-compartment growth chamber having a semi-permeable memberane between compartments is used. First the diffusion rate of nutrients in the system will be determined by placing sediment water in one compartment and pure water in the other and measuring the change in nutrient content of the pure water with time. Secondly, a seed solution of algae cells will be added to pure water side of the growth chamber and growth rates measured by increase in cell mass or chlorophyll content. Growth of algae in standard nutrient solutions will be used as a measure of the ability of the sediment water system to supply nutrients to algae assuming that diffusion of nutrients across the semi-permeable membrane is not a limiting factor. By appropriate chemical determinations, the rates of algae growth and nutrient uptake can be measured and equations developed to predict the rates of nutrient supply by the sediment phase based upon sediment properties and nutrient diffusion rates.

8.5 Rainfall Simulator Tests

The procedures for conducting simulated rain tests are essentially as follows:

Plot size -- Equipment is assembled over groups of four plots. Two plots are 12' x 35' separated by a 6' border. The other two plots are each 6' x 35' separated by a 1' border. The group of four plots occupy an area approximately 50' x 60'. This allows room for installing runoff measuring equipment at the base of the plots and anchor cables to hold the equipment in place.

Plot arrangements -- Plots are laid out so that slope direction is alligned with plot length. In all cases tillage and row directions are up and down the major slope.

Water supply -- A clean (free of sediment and nutrients) source of water is necessary. A portable tank with water hauled to the site is the most frequently used water supply.

Land preparation -- A variety of cultural practices and methods of land preparation will be tested. Runoff samples will be collected from both unfertilized plots and plots where a known application of fertilizer has been made.

Fertilizer to be used is in the forms of NH_4NO_3 and treble super phosphate applied by broadcasting on the surface.

(1) Tests to determine base valves for runoff, sediment and nutrient concentrations.

Fallow plots are to be prepared by turn plowing and then disking to keep weed free. Tests are to be conducted on four major capability classes of soils that account for more than 80% of the capability classes in the test watershed.

Test storms -- The following test sequence is applied to all locations. The two 12' x 35' plots receive the following test storms:

(a) Storm 1a - 60 minute duration at 2-1/2 inches per hour.

(b) Storm 2a - 30 minute duration 24 hours after storm 1a at 2-1/2 inches per hour.

(c) Storm 3a - 30 minutes duration 15 minutes after the end of storm 2a at 2-1/2 inches per hour.

(d) Storm 4a - 15 minutes duration 15 minutes after the end of storm 3a at 5 inches per hour.

The 6' x 35' plots are tested by the following storm sequence:

(a) Storm 1b - approximately 45 minutes of rain, then rain stopped and inflow added until the runoff reached the level attained where rain alone was used.

(b) Storm 2b - 30 minutes rain at 2-1/2 inches per hour plus inflow at the rate applied in storm 1b.

(c) Storm 3b - 30 minutes total duration with first 15 minutes using inflow alone at the rate used in storm 1a and double inflow used for the last 15 minutes.

(d) Storm 4b - 15 minutes duration with double inflow used in conjunction with 2-1/2 inches per hour of rain.

Runoff is sampled at approximately 5' intervals for both sediment content and nutrient content. Nutrient samples are frozen within two hours after runs are completed. All samples are returned to Purdue for analyses of sediment and nutrients.

(2) Tests to determine effects of cultural practices on runoff, sediment and nutrient concentrations.

Several crop production and management systems will be compared on the same sites where base valves were obtained. The test storm sequence and procedures for handling samples discussed

earlier will be followed. Cultural practices tested by this technique include:

(i) fall plowing
(ii) winter cover
(iii) several forms of conservation tillage
(iv) crop rotations
(v) residue management
(vi) overgrazing of pasture
(vii) animal waste disposal on crop and pasture land

Additional information about the use of the Purdue Rainulator (rainfall simulator) is found in Appendix 9.7 to this document.

8.6 Tillage Management Demonstration Areas

In order to encourage landowners in the Black Creek Watershed to gain experience with tillage managment systems with which they are not familiar, a strip test system of comparisons will be established. All important soils of the watershed will be included with the exception of overflow bottomlands.

Soil manipulation in tillage generally reduces soil granule size and strength to resist impact of raindrops. It encourages faster slake of granules, filling of surface soil pores, and reduction of water intake leading to conditions where soil erosion can increase. Effects are conditioned by the amount of tillage performed.

Much is known about the effects of heavy tillage, planting, and cultivating equipment on reduction of granule size, compaction of subsurface layers, and reduction of crop rooting. These can produce delayed downward percolation of water, slow soil drainage, and decreased trafficability that delay planting in wet spring periods.

Much is also known about the effects of soil texture and organic matter in helping soils resist bad effects of heavy tillage and in promoting structural recuperation during the off-crop season.

In Black Creek Watershed, there are soils of a wide range of textures, organic matter content, and natural soil drainage. These range from low organic matter, rather unstable, loamy sands and sandy loams to high organic matter, silty clay loams and silty clays of high stability. This suggests desirability of adopting a wide range of tillage planting systems which can assure good plant populations, adequate weed control and satisfactory yield in various soils.

Based on long term Purdue research and field trials (see appendix 9.8), as well as work in neighboring states, aceptable systems to fit given soils can be based on Mold Board Plowing Spring or Fall, Chisel Plowing Spring or Fall. Till planting with sweeps eliminating the need for yearly planting, and narrow strip tillage in a mulch such as coulter planting, which can also eliminate needs for yearly plowing. While

moldboard plowing has the widest adaptation, the other three systems can be adapted if choices are carefully made to suit soil and cropping conditions.

Early studies in Black Creek Watershed show that moldboard plowing is the dominant land preparation followed by sufficient discing or harrowing to make a rather fine seedbed. This is usually called conventional tillage. At the same time such methods are usually the most labor and energy consuming and do the most to reduce granule size and make soil and surfaces smoothest and most susceptible to erosion.

Use of simulated rainfall has repeatedly shown that on sloping land the three systems not based on a regular use of a moldboard plow are most protective against erosion. Coulter-plant tillage in a mulch can reduce erosion by 80-90 percent and tillplant can reduce it 60-70 percent especially if used cross-slope. Chisel plow systems offer real advantages in reducing plow sole compaction and inducing early spring soil drainage. For Fall basic tillage the chisel plow provides a cloddy, trashy surface which offers good protection against wind and water erosion losses in vulnerable early spring periods. Double discing for primary tillage leaves a trashy surface cover and may be adequate land preparation in some soils while still reducing erosive tendencies (see Appendix for Black Creek Specifications 475, for "Minimum Tillage.").

Since need for tillage is the one common denominator in land mangement for cropland, any systems offering soil physical improvement as well as savings in labor and time are worth strong consideration. When adopted regularly they can become very important tools in erosion prevention and can be applied either with or without the use of other erosion control practices many of which are difficult to use in today's large equipment, row crop farming. Gradual adoption of limited or minimum tillage practices could effect an overall erosion reduction in the watershed of considerable magnitude.

For these reasons much emphasis will be placed on helping farmers study reduced tillage systems by use of field strip demonstrations comparing adapted systems to conventional ones side by side. These will hopefully lead to expansion of best adapted systems to a field basis. At the same time, use of simulated rainfall will be employed on plots over a wide range of soil textures on which tillage variables are employed in preparation of the plots. These will substantiate, for Black Creek Watershed soils, what improvements in surface soil stability, infiltration, water intake rate and erosion prevention can be achieved by reducing tillage operations. This will allow extrapolation of results to similar soils of the Maumee Basin as a whole.

8.7 Fish Collection Methods

Population abundance and species composition of fish is being studied in six specified areas in the Black Creek Watershed. Although fish

populations will be surveyed in some study areas by seining and electo-fishing, most of the comparative data will be collected with rotenone. One fish sample will be obtained with rotenone from each study area annually. Although multiple stations should be established on each tributary, in order to obtain more accurate lists of the fish species present and to better estimate the average population abundance, the small area available makes such action unwarranted.

The first requirement considered in the site selection process was easy access to the sample site. Thus, all stations are accessible from a highway bridge or farm lane. After the general area has been selected the specific sample site is chosen to include typical fish habitat for that area. For example, at least one pool and a riffle area are included in every station. Bridges are not considered typical fish habitat and are excluded from every station.

Prior to treatment, each sample site is measured and blocking nets installed. Sample sites are always 300 feet long. Stream width and average depth are measured every 50 feet to determine water volume in the 300 foot section. In addition, a crude map is constructed for later reference to show the general shape of the stream, the depth and location of any pools, the site and type of any cover in the stream, and areas of cover along the stream bank.

Sample sites are approached quietly and blocked off at both ends with a 1/4 inch mesh minnow seine. The seins are held in place and anchored tightly to the bottom by steel fence posts. Starting at the upstream net, 4 ppm by volume emulsified rotenone is applied by hand broadcasting the white liquid from a pail. Proceding downstream, a special effort is made to treat quiet backwaters, muskrat holes, and other parts of the stream that the main slug of poison appears to bypass. As the rotenone approaches the downstream net, an assistant begins detoxification with 8 ppm potassium permanganate. This procedure and these concentrations were suggested by the Division of Fish and Wildlife, Indiana Department of Natural Resources through Bob Robertson, District Fish Management Biologist at Knox.

Fish are collected with hand nets as they float downstream. Several collection passes are also made throughout the sample site to pick up fish from the bottom and the shoreline. Collection is continued until no more fish are found, which usually requires three or four hours per station. The fish are preserved immediately in 10 percent formalin and then transported back to the laboratory. Finally, fish for each sample site are kept separate from fish of other sample sites.

The fish are held in 10 percent formalin for approximately a week, then washed in tap water and stored in 70 percent ethyl alcohol. Fish from each sample site are separated by species and counted. Total weight for all individuals of each species is determined to the nearest gram on a dietetic scale manufactured by Pelouze, Evanston, Illinois. The average weight for each species is also determined by dividing the total weight of a species by the total

number of that species. The size range for each species is determined by measuring the total length of the shortest and longest fish to the nearest millimeter.

8.8 Stream, Channel and Bank Study

There are indications that a major source of erosion and settlement in the Maumee River basin is from stream channel banks including the area immediately adjacent to the streams. To determine the contribution of sediment from the stream channel area detailed studies will be conducted.

One study will consist of the attempt to determine the relation of soil properties, bank slopes, cover and channel grade. Five to ten sites will be selected for evaluation. This study will examine the presently stable and unstable condition for the interrelationship of the above factors. Some mechanics tests which are to be made by the Soil Conservation Service will provide data important to the above mentioned evaluation. Some of the soil mechanics tests to be conducted are: dispersion, sheer parameters, bulk density, and Atterberg limits. Tractive force and slope stability measurements will also be made.

If adequate sites can be found another study will compare the stability of channels with tree covered banks to those under grass cover and to those where trees have recently been cut, this will require securing sites with similar soil properties, cross section and channel flow, and equal flow velocities for the various cover types to be compared.

The effects of different mulching materials will be evaluated by using available sites or constructing necessary sites with bank slopes of 2:1, 3:1, and 4:1. Some of the mulching material to be studied are stone, straw, wood chips, and commerically available spray stabilizing materials. Each material will be evaluated for its effectiveness in promoting grass cover while controlling erosion on the different slopes during the establishment of the grass cover. Each mulching material tested for each slope condition will consist of a section of 50 ft. long on both sides of the channel. A check that has no mulch will be used for comparison. This study will be repeated in at least two locations throughout the watershed area. If other mulching materials are secured they may also be included in the study. Different rates of seeding or different seed materials may be combined with this mulch study.

Badly eroding sections of stream banks will be armor plated by the use of rip-rap or other materials for the analysis of its effectiveness. Some grade stabilizing (grade reducing) structures and other structural means of erosion control in or adjacent to the channel may be available for analysis as the land treatment measures progress.

The channel stability evaluations will consist of cross-sectional measurements using standard surveying procedures. In so far as possible each cross-sectional measurement will be replicated for a given set of conditions so that a statistical analysis can be conducted.

The streambank studies combined with an evaluation of the land treatment measures in and adjacent to the channel will provide information to refine the projections to the Maumee Basin and should furnish some useful insight of the ways in which ditch bank treatment affects erosion and sedimentation.

8.9 Modeling and Prediction

The mechanism whereby it is hoped that a prediction of sedimentation and related chemical pollution of the Maumee River and Lake Erie can be related to land use is a systems approach using computer simulated models of sedimentation and related chemical pollution in the river and the lake.

A review of literature reveals six different approaches to the prediction of sediment yield from watersheds. Each of these approaches is being applied to the Black Creek Watershed. Fundamentally, all of these models are of the lumped variety and no accounting is made of special distributions within a watershed. The success of these models has been varied and depends to a great deal on the care with which model coefficients have been selected. Most of these have little relationship to physical constants. For this reason the attempt will be to develop a distributed model.

As the size of a watershed increases, more and more of the variables will be lumped into larger, less descriptive variable. This is necessary because the model, even if computer-based, tends to become unwiedly. Perhaps more important, the detail, if confined to small areas will be essentially lost anyway. This is why it is important to model both the Black Creek Watershed, a representative watershed within the Maumee Basin, and the Maumee Basin for which answers are ultimately needed.

As of now, the statistically based Universal Soil Loss Equation is the best estimator of soil loss from small areas and should also be the best estimator of the maximum sediment potential into receiving streams and lakes. Other obviously needed information are estimates of sediment discharges at any point in the receiving water system. Hopefully, the long term USGS and Corps of Engineers records at various locations along the Maumee River and at the Toledo harbor will be sufficient data for the Maumee River Basin. If not, verification of the model cannot be fully attained since the collection of additional sediment rate data outside of the Black Creek Watershed region is not within the scope of this project. However, within the Black Creek Watershed and at a few select locations on the Maumee River near the target watershed, sediment sampling is a major item in the total monitoring program. Verification of any modeling on the Black Creek Watershed will be of necessity await the monitoring

results. Land use within the watershed is intense and fairly homogeneous. This could work to the advantage of the project if improved land use practices were developed in an orderly progression from one sub-watershed to another. However, changes in land use practices will have to be major and extensive if the effect of these practices are to show up significantly in both the monitoring program and the modeling.

8.10 Data Management

After water sample analyses have been completed, data is organized on a master data sheet and computer cards are keypunched from it. A code number at the beginning of each data card indicates the type of sample and the geographical site of collection. The cards will be arranged in chronological order for each site for each type of data format. Thus a reliable and permanent backup library will be available should something happen to the tape file. Periodically, the cards will be reread to update or correct the tape.

Both the stage recorder and recording rain gage data are recorded on paper charts that show depth versus time. The charts are returned to the Agricultural Engineering Department at Purdue where they are read using a computer-connected reading table. The time, depth, and date for each point read are then printed out by computer. This process greatly reduces the time required to analyze the large number of charts that are being used in this project. A master data sheet is then prepared and cards are keypunched using one date per card. The cataloging process is identical with the process used on the water sample data as described above.

As previously stated, the card deck will be read into the computer and recorded on magnetic tape. Considering the large quantity of data to be collected and handled during this project, the magnetic tape method is mandatory. Once the data is on tape, it may be retrieved in several different fashions. A complete printout of all of the data from one category may be obtained by specifying the category code only. A printout for a specific site within a category may be obtained by specifying both the category code and site identifier. Particular points may be selected by specifying the particular card number(s) for the date(s) in question. These methods will also be used to transfer certain data into other computer systems, such as EPA's Storet system.

At present, plans are to use Purdue's School of Agriculture MIRACLE computer system for data storage and analysis. The main reasons for this choice is the proximity of the computer facility to all of the cooperating departments and the ease of access. Since remote terminals are available in several locations. However, should the size of the data library exceed the capacity of the MIRACLE system, the University's large CDC 6500 computer system could be used to handle the large quantities of data with very little modification to the storage and retrieval program.

8.11 Sociological Studies

The primary focus of the first sociological study to be undertaken as a portion of this project is to look at the behavioral components of sediment control in the basin. To accomplish this task, personal interviews will be conducted with all landowners (over 10 acres) in the watershed.

The basic objectives of these interviews are:

(a) To determine attitudes and knowledge toward pollution and pollution control.

(b) To determine knowledge of the Black Creek Project and extent of participation.

(c) To assess the past, present and anticipated future involvement in select agricultural practices.

(d) To determine the sources of information on pollution control and agricultural practices.

(e) To investigate landowner involvement and contact with groups, organizations, and agencies in the study area.

(f) To develop a data base for future studies during the duration of the project to serve as a bench mark for monitoring change.

To accomplish these objectives, a research instrument of the form of a questionnaire is being developed for collecting data from landowners. A brief description of each section of the questionnaire is included here for additional information. The questionnaire is being pretested and modifications will probably be necessary before it is applied to the watershed.

Part I contains 23 questions designed to measure general knowledge and attitudes toward pollution control. Questions are designed to look at standards and regulations of agencies and the landowners perception of how they are being enforced. Each landowner is also asked how much he would be willing to pay in a hypothetical situation for a high rate of pollution control.

Part II shifts its emphasis from the general to attitudes specifically about the local community and county. Representative questions are designed to analyze participation and cohesiveness of community residents in solving problems and what should be done if farms, residences, or businesses are identified as major polluters.

Part III studies attitudes toward water and soil resource development. Here the questions are designed to get at sources of pollution and an assessment of the adequacy of soil and water conservation management in the county.

Part IV begins to look at specific behavior. One kind of behavior is household waste disposal as a possible source of pollution. Specifically, the question here focus on sewage disposal by asking about septic tank capacity, distance located from water source, how often it is pumped out, plus overall perceived adequacy of sewage disposal for the basin.

Part V specifically looks at what the landowner is doing in reference to his land possession and use. That is, number of acres, kinds of crops, yield per acres, etc. The landowner is also asked if he has a conservation plan. and to what extent it has been followed. In addition, a list of farm problems and questions is proposed and the landowner is asked to whom he would go for help in each situation.

Part VI is concerned with the landowner's present knowledge and involvement in the Black Creek project. Is he familiar with it, what agencies and groups are involved, what is his overall reaction to the project, what benefits does he think will acure to him, the community and the county.

Part VII asks the landowner to indicate his contact during the past year with local agencies and his membership in organizations.

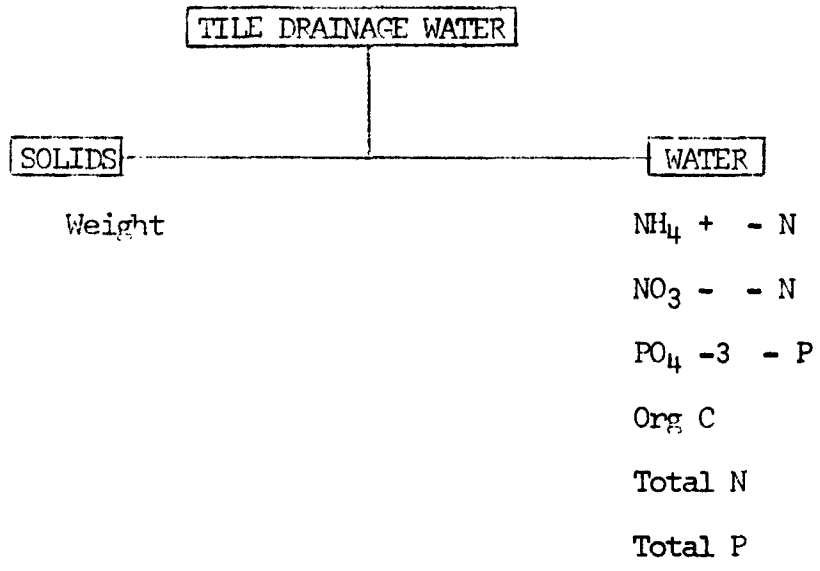
Part VIII looks at 16 different land practices that are considered to be effective methods of pollution control. Each practice is presented to the landowners and each is asked to respond to his current, past and likely future involvement with that practice on his land.

Part IX is designed to provide demographic information on the landowners for analysis of involvement with project practices across socio-economic characteristics.

An additional section is under development which will allow the landowner to classify his land with respect to categories of soils data and land capability so that appropriate conservation practices can be related to the characteristics of the land.

Findings from the first study will provide guidance for additional sociological studies throughout the project period. In addition, consideration is being given to a study of the characteristics of landowners (about 40) who have participated in some phase of conservation with the Soil and Water Conservation District and compare that group to non-participants. Toward the end of the project, landowners will be reinterviewed in an attempt to identify changes in land practices and attitudes toward pollution control.

FIGURE 8-1 Analysis Flow Charts for Sub-Surface Drainage and Precipitation Samples



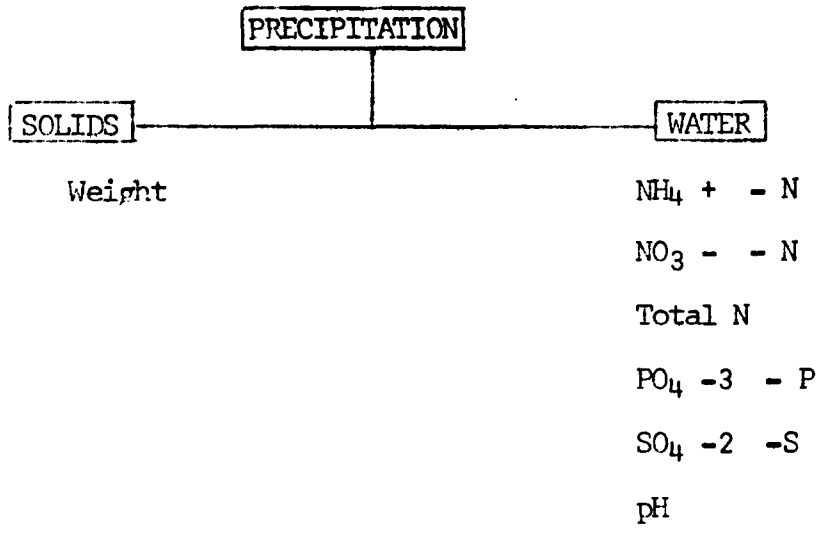


FIGURE 8-2 Flow Chart for Rainulator Samples

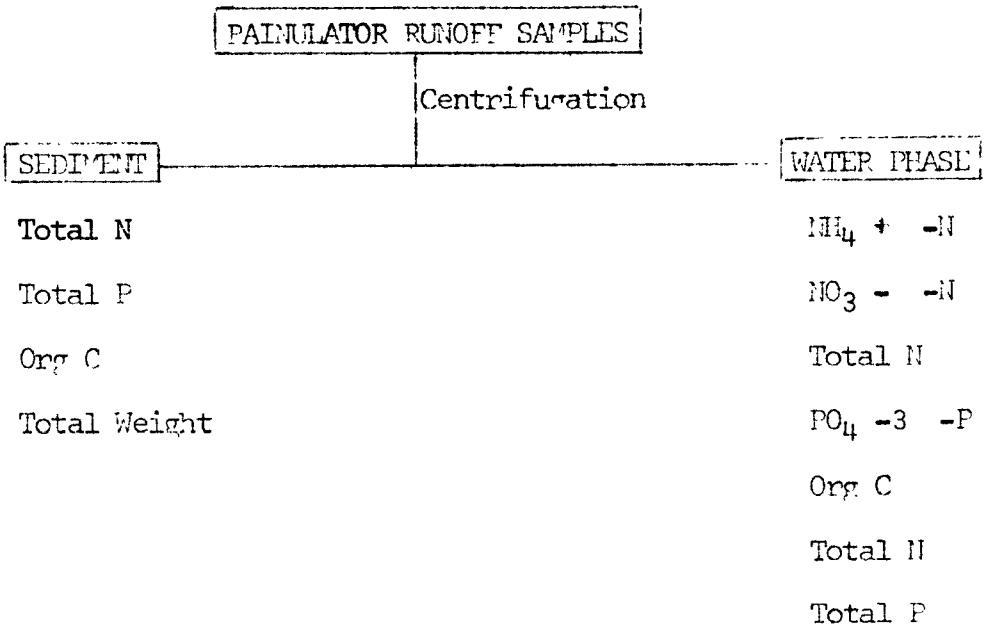
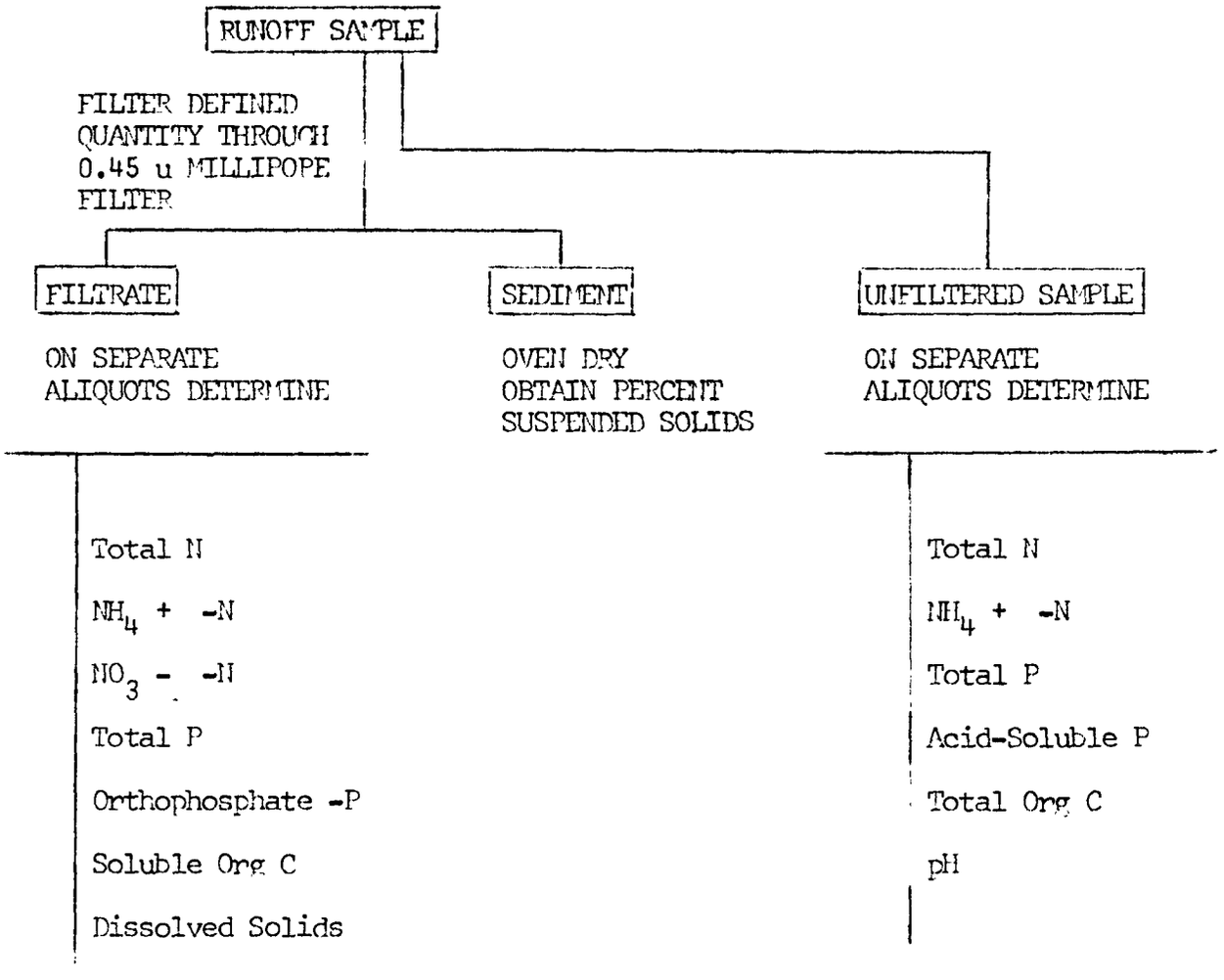


FIGURE 8-3 Fractionation Scheme for N and P in Detailed Laboratory Studies



From these data the following parameters may be obtained:

1. Soluble NH_4 + -N
2. Exchangeable NH_4 + -N on sediment
3. Dissolved Organic N
4. Sediment Total N (suspended N)
5. Soluble NO_3^- -N
6. Soluble orthophosphate -P
7. Soluble organic P
8. Sediment Total P (suspended P)
9. Dilute acid-soluble P in sediment
10. Dissolved organic C
11. Suspended organic C
12. pH
13. Suspended Solids
14. Dissolved Solids

COOPERATIVE AGREEMENT
between the
ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT
and the
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

Relative to: Reduction of Sediment and Related Pollutants in the Maumee River and Lake Erie

Authority: PL-46 - 74th Congress, 16 U.S.C. (590 a-f)

THIS AGREEMENT, made and entered into this 21st day of [illegible], 197 2, by and between the Allen County Soil and Water Conservation District, (hereinafter referred to as the "District") and the United States of America, acting by and through the Soil Conservation Service of the United States Department of Agriculture (hereinafter referred to as the "Service").

THE DISTRICT is engaged in a five-year program to evaluate methods of improving water quality in the Maumee River and Lake Erie through the reduction of sediment, phosphate and other nutrients, and related pollutants entering the waters of the river and lake as a result of soil erosion.

THE DISTRICT proposes to demonstrate the means of achieving significant reductions in sediment and related pollutants through a voluntary land treatment program involving a diverse group of persons who own or control the land which is a source of this pollution.

THE DISTRICT, for planning and program purposes, requests certain soil and water conservation technical assistance and information that is presently unavailable and, within the limits of its resources, is willing to reimburse the Service for a portion of the costs of obtaining such information required in the conduct of the program within the period specified in this agreement. The District is financing this program from an EPA Grant and is working in cooperation with EPA, the Service and Purdue University.

THE SERVICE, in the conduct of its assigned responsibilities under legislative authorities and through Memoranda of Understanding with the District, is charged with providing technical assistance leading to the conservation of soil, water and related resources in Allen County, Indiana.

THE SERVICE has need for technical information to develop a Work Plan and to properly furnish technical assistance over the five-year project life. These needs are in addition to those normally encountered in providing technical services to the District and require additional staff resources.

THE DISTRICT AND THE SERVICE desire to cooperate on a proposal to reduce Sediment and Related Pollutants in the Maumee River and Lake Erie.

IT IS THE intent of the parties hereto that cooperation herein shall be for their mutual benefit and the benefit of the people of Allen County, State of Indiana, and the United States; and,

THE WORK PLAN development, land treatment measures, and types of incentives to be accomplished and conducted under this agreement will be cooperatively planned and carried out;

NOW, THEREFORE, for and in consideration of the promises and mutual covenants herein contained, the parties hereby mutually agree with each other as follows:

A. THE DISTRICT AGREES:

1. That all information obtained under the terms of this agreement is public property and is to be used in developing and implementing a Work Plan for the Reduction of Sediment and Related Pollutants in the Maumee River and Lake Erie.

2. To reimburse the Service for a portion of the costs incurred in developing and implementing this Work Plan, to include: technical services of Service personnel - included herein are the costs of salaries, travel, allied benefits such as leave, holidays, retirement, health benefits, life insurance, and support and overhead costs. Support costs are to include cartographic services provided as needed in Work Plan preparation.

3. Reimburse the Service in an estimated amount of $185,364.00 for the District's share of the Service's contribution in this cooperative effort. The District's share will be based on the estimated actual cost of A.2. and within the five-year schedule shown in the following table and as set forth in the District's Proposed Plan which is attached to and made a part of this agreement.

FROM TO	Oct '72 May '73	May '73 Oct '73	Oct '73 Oct '74	Oct '74 Oct '75	Oct '75 Oct '76	Oct '76 Oct '77	TOTAL
Professional Soil Consvst GS-9 or Above							
Man-Years	1.0	0.5	1.5	1.2	1.0	0.5	
Est. Cost	$20,000	$10,500	$33,075	$28,350	$24,800	$13,025	$129,750
Sub-Professional Soil Cons Technen GS-6 or Above							
Man-Years	0.0	0.0	0.5	0.8	1.0	1.0	
Est. Cost	0	0	$ 7,768	$12,970	$17,013	$17,863	$ 55,614
Total Estimate	$20,000	$10,500	$40,843	$41,320	$41,813	$30,888	$185,364

4. That the signature of the authorized representative of the District on this agreement is official notice for the Service to begin work.

5. To provide the Service with 50 copies of the Work Plan and 50 copies of all printed final results of the program.

6. That technical assistance furnished to landowners and operators will meet the technical guide standards and design criteria of the Service.

B. THE SERVICE AGREES:

1. To provide the necessary technical services and on-site technical assistance normally needed to produce the results desired as set forth in the District's project proposal which is attached to and made a part of this agreement.

2. To absorb from its own appropriations any portion of the estimated costs of providing these services not covered by the amounts to be reimbursed the Service as agreed to above.

3. To provide the District with a monthly progress narrative on the status of the program.

4. That technical assistance furnished to landowners and operators will meet the technical guide standards and design criteria of the Service.

C. IT IS MUTUALLY AGREED:

1. That the Work Plan will be consistent with applicable water quality standards established for the Basin pursuant to current law and will recommend means for standards maintenance and improvement.

2. That the Work Plan will identify the watershed area, monitoring sites, and management techniques that will be used to implement the plan.

3. That the Work Plan will include a detailed sociological study that will aim to assess the attitudes of individual landowners, the factors that appear to have convinced persons to participate in an implementation program and the factors which may have precluded the participation of others. The Purdue University team will have the principal inputs for the sociological part of the Work Plan.

4. Completion Date - All work under this agreement is to be completed on or about October 1977, unless mutually extended by Amendment to this agreement.

5. Method of Payment - The Service will bill the District at the times and in the manner set forth as follows: Quarterly

6. Intent to Cooperate - It is the intent of the Service to fulfill its obligations under this agreement. However, commitments cannot be made beyond the period for which funds have been appropriated by Congress. In event funds from which the Service may fulfill its obligations are not appropriated, this agreement will automatically terminate. Reimbursement will then be for work completed that is otherwise eligible for reimbursement prior to the effective date of termination. It is further understood that District financing under this agreement is contingent upon EPA funding of the grant over the five-year life of the project proposal.

7. Renewals - This agreement will remain in force until June 30, 1973. It may be affirmatively renewed each fiscal year by the parties by amendment until the purposes of the agreement are complete but not later than the end of the fiscal year in which the work is completed.

8. Modification - This agreement may be modified by amendment duly executed by authorized officials of the District and the Service, provided such modification does not extend the agreement beyond the close of the fiscal year in which the work is completed.

9. Officials Not to Benefit - No Member of or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

IN WITNESS WHEREOF, the District and the Service have executed this agreement as of the date first above-written.

ALLEN COUNTY
SOIL AND WATER CONSERVATION DISTRICT

BY _____

TITLE Chairman

The signing of this Agreement was authorized at a Meeting of the Supervisors held at Fort Wayne, Indiana, on the 8th day of November, 1972.

BY Raymond C. Arnold (JS)
Secretary

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

BY _____
State Conservationist

DATE November 10, 1972

MEMORANDUM OF AGREEMENT
between
ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT
and
PURDUE RESEARCH FOUNDATION

This agreement is entered into this 7th day of January 1973, effective October 20, 1972, between ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT of Fort Wayne, Indiana, (hereinafter referred to as The District), and PURDUE RESEARCH FOUNDATION of Lafayette, Indiana, (hereinafter referred to as the Foundation).

WITNESSED THAT
WHEREAS, The District has been designated by the terms of Environmental Protection Agency Grant No. G-005103, to conduct a research program entitled "Reduction of Sediment and Related Pollutants in the Maumee River and Lake Erie", and

WHEREAS, The District desires to have the Foundation perform certain work or services under the terms and conditions herein set forth, said work or services being within the scope of the foresaid grant, and

WHEREAS, the Foundation has the necessary personnel and facilities to perform the work or services for The District.

NOW THEREFORE, it is agreed as follows:
1. The period of this agreement shall be October 20, 1972, through April 19, 1973.

2. The work services to be performed by the Foundation under direction of Dr. Rolland Z. Wheaton shall be as follows:
   a. Assist in evaluation of the sediment-erosion problems the Maumee Basins.
   b. Assist in the selection of a target watershed in Aller County for application of land treatments.
   c. Select sites for monitoring the effects of land treatn on erosion and sedimentation.
   d. Review basic social and economic characteristics of re dents in the target watershed and Allen County. Deve: plans and guide lines for interviews of residents con· cerning their views towards sediment reduction practi(

3. The total cost of the services to be performed by the Fou shall not exceed $24,650 of which The District shall prov: $11,044 or 44.8% of the total project cost and the Found· agrees to contribute from non-Federal sources $13,606 or 55.2% of the total project cost, whichever is less, to mee the cost sharing requirements of said grant.

4. Reimbursement of cost incurred under the terms of this ag ment will be made quarterly by The District upon receipt vouchers from the Foundation. The vouchers should includ itemization of cost incurred by major budget category and amount of non-Federal monies contributed to this work or vices by the Foundation. Copies of vouchers should be fo warded to James E. Lake, Executive Park Suite 103, 2010 Inwood Drive, Fort Wayne, Indiana 46805.

5. The agreement shall be administered in accordance with th Interim Regulations of the Environmental Protection Agenc for Grant Programs dated November 17, 1971, and subsequer revisions or supplements in effect as in the date of this agreement.

The following reports will be required:

a. Informal monthly progress reports.

A. By Executive Order 11627, dated October 15, 1971, the President stabilized prices, rents, wages and salaries. The Foundation represents that to the best of its knowledge and belief, it is in complete compliance with Executive Order 11627. Further, the Foundation warrants that the amounts invoiced under this agreement shall not exceed the lower of (1) the agreement price, or (2) maximum levels established in accordance with the order.

B. The Foundation agrees to insert the substance of this clause including this paragraph B in all subcontracts for supplies and services issued under this agreement.

PURDUE RESEARCH FOUNDATION

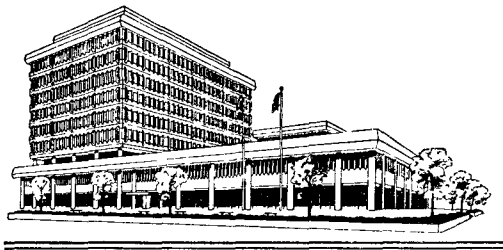
Date: _____ By _____

F. N. Andrews
Vice-President and General Manager

ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT

Date: _____ By _____

ORVAL E. GIBSON
CHIEF DEPUTY



William L. Sweet, P.E., L.S.

ALLEN COUNTY SURVEYOR

ONE MAIN STREET, 6TH FLOOR FORT WAYNE, INDIANA 46802 PHONE (219)423-7625

May 3, 1973

Allen County Soil & Water Conservation
District
Executive Park- Suite 103
2010 Inwood Drive
Fort Wayne, Indiana 46805

Attn: James Lake

Re: Approval by the Allen County Drainage Board of your sediment study project as it relates to Legal drains.

Dear Jim:

Your letter received here April 4th has been discussed with the Allen County Drainage Board and I am happy to advise you that the Board has reaffirmed its authorization to the Allen County Surveyor in this matter.

The Board originally authorized the Surveyor to proceed at its March 21st, 1973 meeting as indicated by Board Resolution # 73-51, however at that meeting the Board requested that you furnish additional information. Your April 4th submission meets the needs of the Board as expressed in the Resolution and I enclose a copy of the Resolution in its complete form.

The Board values the initiative that your group has shown in starting this project, and if you feel we can at any time render you further assistance, please let us know.

Very truly yours,

William L. Sweet, P.E.,L.S.
Allen County Surveyor

WLS/hmf

WHEREAS the Allen County Drainage Board at its March 21st, 1973 meeting has heard a presentation by James Lake, Project Manager of the Maumee Sediment Project for which the Allen County Soil & Water Conservation District is sponsoring agency; and

WHEREAS said Drainage Board recognizes the value of this Project to the community, to the Maumee watershed, to Lake Erie, and more particularly recognizes its direct value to landowners in Allen County and primarily within the water shed of Black Creek (a legal drain in Allen County):

NOW THEREFORE BE IT RESOLVED that the Allen County Drainage Board joins with the Allen County Surveyor in authorizing all reasonable use of the right of entry defined in the Indiana Drainage Code of 1965 as amended to the persons engaged in performing within and under the aforesaid Proj Provided only that the Project management furnish to the Drainage Board in writing a brief description of said Project together with a listing of the major Legal Drains involved with said description and listing to be appended to this resolution and become a part hereof: and

BE IT FURTHER RESOLVED that the Allen County Surveyor is hereby authorized to promulgate this resolution upon said surveyors receipt and approval of the aforementioned description and listing.

The foregoing resolution duly moved and second and approved by the Allen County Drainage Board at its meeting on March 21, 1973.

Attest:

Helen M. Fair

Helen M. Fair,
Secretary Protem

S O I L & W A T E R C O N S E R V A T I O N

DATE 12/28/73 — P R O J E C T O V E R V I E W —

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
	*** DISTRICT ***						
00-101	SALARY AND WAGES						
		APPROPRIATED	2,150.00	2,100.00	2,200.00	2,300.00	2,400.00
		PAYMENTS	516.50				
		COMMITMENTS					
		UNENCUMBERED	1,633.50	2,100.00	2,200.00	2,300.00	2,400.00
00-102	FRINGE BENEFITS						
		APPROPRIATED	180.00				
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED	180.00				
00-103	CONSULTANT SERVICES						
		APPROPRIATED					
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED					
00-104	EQUIPMENT						
		APPROPRIATED	966.00	500.00	700.00	700.00	700.00
		PAYMENTS	910.73				
		COMMITMENTS					
		UNENCUMBERED	55.27	500.00	700.00	700.00	700.00
00-105	SUPPLIES						
		APPROPRIATED	175.00	200.00	200.00	200.00	200.00
		PAYMENTS	101.10				
		COMMITMENTS					
		UNENCUMBERED	73.90	200.00	200.00	200.00	200.00

S O I L & W A T E R C O N S E R V A T I O N

DATE 12/28/73 — P R O J E C T O V E R V I E W —

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
00-106	TRAVEL						
		APPROPRIATED	455.00	200.00	200.00	200.00	100.00
		PAYMENTS	410.00				
		COMMITMENTS					
		UNENCUMBERED	45.00	200.00	200.00	200.00	100.00
00-107	PUBLICATION COSTS						
		APPROPRIATED	225.00	50.00	100.00	100.00	100.00
		PAYMENTS	197.08				
		COMMITMENTS					
		UNENCUMBERED	27.92	50.00	100.00	100.00	100.00
00-108	OTHER - GOV. UNITS						
		APPROPRIATED	500.00	1,000.00	1,000.00	1,100.00	1,200.00
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED	500.00	1,000.00	1,000.00	1,100.00	1,200.00
00-109	SAVINGS ACCOUNT						
		APPROPRIATED					
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED					
	DISTRICT TOTALS						
		APPROPRIATED	4,651.00	4,050.00	4,400.00	4,600.00	4,700.00
		PAYMENTS	2,135.41				
		COMMITMENTS					
		UNENCUMBERED	2,515.59	4,050.00	4,400.00	4,600.00	4,700.00

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
*** PURDUE ***							
200-201	SALARIES						
		APPROPRIATED	45,395.00	81,297.00	84,187.00	87,145.00	87,177.00
		PAYMENTS	4,485.81				
		COMMITMENTS					
		UNENCUMBERED	40,909.19	81,297.00	84,187.00	87,145.00	87,177.00
200-202	FRINGE BENEFITS						
		APPROPRIATED	1,249.00	1,801.00	1,866.00	3,632.00	3,725.00
		PAYMENTS	462.39				
		COMMITMENTS					
		UNENCUMBERED	786.61	1,801.00	1,866.00	3,632.00	3,725.00
200-203	EQUIPMENT						
		APPROPRIATED	18,175.00	9,000.00			
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED	18,175.00	9,000.00			
200-204	SUPPLIES AND EXPENSES						
		APPROPRIATED	3,700.00	4,200.00	4,200.00	4,200.00	4,200.00
		PAYMENTS	43.48				
		COMMITMENTS					
		UNENCUMBERED	3,656.52	4,200.00	4,200.00	4,200.00	4,200.00
200-205	TRAVEL AND PER DIEM						
		APPROPRIATED	12,000.00	14,700.00	14,700.00	15,000.00	12,100.00
		PAYMENTS	1,400.36				
		COMMITMENTS					
		UNENCUMBERED	10,599.64	14,700.00	14,700.00	15,000.00	12,100.00

SOIL & WATER CONSERVATION

DATE 12/28/73 — PROJECT OVERVIEW — PAGE 4

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
200-206	CONSTRUCTION						
		APPROPRIATED	20,000.00	10,000.00			
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED	20,000.00	10,000.00			
200-207	OPERATIONAL COST						
		APPROPRIATED	7,870.00	12,600.00	12,300.00	12,300.00	9,500.00
		PAYMENTS	84.95				
		COMMITMENTS					
		UNENCUMBERED	7,785.05	12,600.00	12,300.00	12,300.00	9,500.00
200-208	OTHER RESEARCH EXPENSES						
		APPROPRIATED	4,275.00	7,500.00	7,500.00	7,500.00	8,000.00
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED	4,275.00	7,500.00	7,500.00	7,500.00	8,000.00
200-209	INDIRECT COST						
		APPROPRIATED	27,695.00	49,054.00	50,682.00	52,354.00	52,145.00
		PAYMENTS	2,884.38				
		COMMITMENTS					
		UNENCUMBERED	24,810.62	49,054.00	50,682.00	52,354.00	52,145.00
	PURDUE TOTALS						
		APPROPRIATED	140,359.00	190,152.00	175,435.00	182,131.00	176,847.00
		PAYMENTS	9,361.37				
		COMMITMENTS					
		UNENCUMBERED	130,997.63	190,152.00	175,435.00	182,131.00	176,847.00

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
	*** SOIL CONSERVATION SERVICE						
300-301	PROFESSIONAL SALARY & BENIFITS						
		APPROPRIATED	33,200.00	29,075.00	36,650.00	16,500.00	13,025.00
		PAYMENTS	21,514.02				
		COMMITMENTS					
		UNENCUMBERED	11,685.98	29,075.00	36,650.00	16,500.00	13,025.00
300-302	SUB-PROFESSIONAL SALARY & BEN						
		APPROPRIATED	9,500.00	15,536.00	18,641.00	21,437.00	
		PAYMENTS	5,852.45				
		COMMITMENTS					
		UNENCUMBERED	3,647.55	15,536.00	18,641.00	21,437.00	
300-305	CARTOGRAPHIC COST						
		APPROPRIATED	1,500.00				
		PAYMENTS	914.53				
		COMMITMENTS					
		UNENCUMBERED	585.47				
300-306	SOIL MECHANICS TESTING COST						
		APPROPRIATED	2,300.00				
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED	2,300.00				
300-307	OTHERS						
		APPROPRIATED					
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED					

ACCOUNT NO.	TITLE	YEAR			
400-406	FARMSTEAD & FEEDLOT WINDBREAKS				
	APPROPRIATED		1,092.00	1,456.00	1,352.00
	PAYMENTS				
	COMMITMENTS				
	UNENCUMBERED		1,092.00	1,456.00	1,352.00
00-407	FIELD BORDER				
	APPROPRIATED	2,875.00	9,114.00	19,985.55	21,247.85
	PAYMENTS				
	COMMITMENTS		3,790.50	441.00	
	UNENCUMBERED	2,875.00	5,323.50	19,544.55	21,247.85
00-408	FIELD WINDBREAK				
	APPROPRIATED		104.00	138.45	147.55
	PAYMENTS				
	COMMITMENTS		80.00		
	UNENCUMBERED		24.00	138.45	147.55
00-409	GRADE STABILIZATION STRUCTURES				
	APPROPRIATED	10,850.00	28,600.00	38,025.00	42,125.00
	PAYMENTS	9,405.45			
	COMMITMENTS	1,006.50	1,638.00		256.00
	UNENCUMBERED	438.05	26,962.00	38,025.00	41,869.00
00-410	GRASSED WATERWAY OR OUTLET				
	APPROPRIATED	7,132.50	5,265.00	2,520.00	4,972.50
	PAYMENTS	5,512.44			
	COMMITMENTS		1,510.56		108.00
	UNENCUMBERED	1,620.06	3,754.44	2,520.00	4,864.50

ACCOUNT NO.	TITLE	FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
	*** INCENTIVE PAYMENTS ***					
400-401	CONSERVATION CROPPING SYSTEM					
	APPROPRIATED	85.00	1,928.55	2,570.75	2,148.25	500.00
	PAYMENTS					
	COMMITMENTS		459.60			
	UNENCUMBERED	85.00	1,468.95	2,570.75	2,148.25	500.00
400-402	CONTOUR FARMING					
	APPROPRIATED		266.50	354.90	278.30	100.00
	PAYMENTS					
	COMMITMENTS			16.00		16.00
	UNENCUMBERED		266.50	338.90	278.30	84.00
400-403	CRITICAL AREA PLANTING					
	APPROPRIATED	2,260.00	520.00	1,040.00	780.00	
	PAYMENTS	960.00				
	COMMITMENTS	520.00				
	UNENCUMBERED	780.00	520.00	1,040.00	780.00	
400-404	CROP RESIDUE MANAGEMENT					
	APPROPRIATED	85.00	1,946.75	2,596.75	2,174.90	500.00
	PAYMENTS					
	COMMITMENTS		189.00	189.00	189.00	189.00
	UNENCUMBERED	85.00	1,757.75	2,407.75	1,985.90	311.00
400-405	DIVERSIONS					
	APPROPRIATED	1,845.00	2,250.00	4,387.50	4,257.50	
	PAYMENTS					
	COMMITMENTS	1,740.00				
	UNENCUMBERED	105.00	2,250.00	4,387.50	4,257.50	

SOIL & WATER CONSERVATION

DATE 12/28/73 — PROJECT OVERVIEW —

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
	SOIL CONSERVATION SRVC TOTALS						
		APPROPRIATED	46,500.00	44,611.00	55,291.00	37,937.00	13,025.00
		PAYMENTS	28,281.00				
		COMMITMENTS					
		UNENCUMBERED	18,219.00	44,611.00	55,291.00	37,937.00	13,025.00

ACCOUNT NO.	TITLE	FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
400-411	HOLDING PONDS & TANKS					
	APPROPRIATED	3,640.00	7,280.00	14,560.00	14,560.00	
	PAYMENTS					
	COMMITMENTS			2,800.00		
	UNENCUMBERED	3,640.00	7,280.00	11,760.00	14,560.00	
400-412	LAND SMOOTHING					
	APPROPRIATED		3,900.00	5,216.25	5,508.75	
	PAYMENTS					
	COMMITMENTS					
	UNENCUMBERED		3,900.00	5,216.25	5,508.75	
400-413	LIVESTOCK EXCLUSION					
	APPROPRIATED	3,235.00	8,279.05	9,081.85	11,449.10	
	PAYMENTS					
	COMMITMENTS	2,444.80	128.00	384.00		
	UNENCUMBERED	790.20	8,151.05	8,697.85	11,449.10	
400-414	LIVESTOCK WATERING FACILITY					
	APPROPRIATED	760.00	650.00	670.00	1,560.00	
	PAYMENTS	420.00				
	COMMITMENTS		210.00			
	UNENCUMBERED	340.00	440.00	670.00	1,560.00	
400-415	MINIMUM TILLAGE					
	APPROPRIATED	67.50	8,622.90	11,501.10	7,980.10	1,200.00
	PAYMENTS					
	COMMITMENTS		1,019.20	1,019.20	1,019.20	1,019.20
	UNENCUMBERED	67.50	7,603.70	10,481.90	6,960.90	180.80

ACCOUNT NO.	TITLE	FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
00-416	PASTURE & HAYLAND MANAGEMENT					
	APPROPRIATED	234.00	1,017.90	1,673.10	1,778.40	
	PAYMENTS					
	COMMITMENTS		362.70	265.50		
	UNENCUMBERED	234.00	655.20	1,407.60	1,778.40	
00-417	PASTURE & HAYLAND PLANTING					
	APPROPRIATED	2,275.00	5,642.00	7,507.50	7,371.00	
	PAYMENTS					
	COMMITMENTS		980.00			
	UNENCUMBERED	2,275.00	4,662.00	7,507.50	7,371.00	
00-418	POND					
	APPROPRIATED	4,250.00	12,000.00	22,750.00	24,375.00	
	PAYMENTS	2,814.48				
	COMMITMENTS		1,566.84			
	UNENCUMBERED	1,435.52	10,433.16	22,750.00	24,375.00	
00-419	PROTECTION DURING DEVELOPMENT					
	APPROPRIATED	195.00	1,820.00	2,730.00	2,925.00	
	PAYMENTS					
	COMMITMENTS					
	UNENCUMBERED	195.00	1,820.00	2,730.00	2,925.00	
00-420	RECREATION AREA IMPROVEMENT					
	APPROPRIATED	500.00	890.00	520.00	650.00	
	PAYMENTS	174.29				
	COMMITMENTS	200.00	700.00			
	UNENCUMBERED	125.71	190.00	520.00	650.00	

400-421 SEDIMENT CONTROL BASIN					
	APPROPRIATED	19,500.00			
	PAYMENTS	1,101.03			
	COMMITMENTS				
	UNENCUMBERED	18,398.97			
400-422 CONSERVATION FIELD TRIALS					
	APPROPRIATED	275.00	675.00	675.00	675.00	675.00
	PAYMENTS					
	COMMITMENTS		100.00	100.00	100.00	100.00
	UNENCUMBERED	275.00	575.00	575.00	575.00	575.00
400-423 STREAM CHANNEL STABILIZATION 2					
	APPROPRIATED	4,000.00	3,800.00	7,800.00	7,800.00	
	PAYMENTS	2,758.40				
	COMMITMENTS					
	UNENCUMBERED	1,241.60	3,800.00	7,800.00	7,800.00	
400-424 STREAMBANK PROTECTION					
	APPROPRIATED	13,000.00	42,282.50	56,374.50	46,943.00	
	PAYMENTS	3,972.50				
	COMMITMENTS					
	UNENCUMBERED	9,027.50	42,282.50	56,374.50	46,943.00	
400-425 STRIPCROPPING					
	APPROPRIATED		260.00	341.25	373.75	
	PAYMENTS					
	COMMITMENTS					
	UNENCUMBERED		260.00	341.25	373.75	

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
400-426	SURFACE DRAINS						
		APPROPRIATED	780.00	6,273.15	8,364.20	8,112.65	
		PAYMENTS					
		COMMITMENTS		175.00			
		UNENCUMBERED	780.00	6,098.15	8,364.20	8,112.65	
400-427	TERRACES, GRADIENT						
		APPROPRIATED		476.45	635.70	675.35	
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED		476.45	635.70	675.35	
400-428	TERRACES, PARALLEL						
		APPROPRIATED		1,430.00	1,906.45	2,026.05	
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED		1,430.00	1,906.45	2,026.05	
400-429	TILE DRAINS						
		APPROPRIATED	18,181.00	13,004.75	15,094.70	5,410.00	
		PAYMENTS	15,890.77				
		COMMITMENTS	518.00	504.00		84.00	
		UNENCUMBERED	1,772.23	12,500.75	15,094.70	5,326.00	
400-430	TREE PLANTING						
		APPROPRIATED		156.00	208.00	156.00	
		PAYMENTS					
		COMMITMENTS					
		UNENCUMBERED		156.00	208.00	156.00	

ACCOUNT NO.	TITLE		FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
400-431	WILDLIFE HABITAT MANAGEMENT						
		APPROPRIATED		2,684.50	3,594.50	3,822.00	
		PAYMENTS					
		COMMITMENTS		97.50			
		UNENCUMBERED		2,587.00	3,594.50	3,822.00	
400-432	WOODLAND IMPROVED HARVESTING						
		APPROPRIATED	195.00	390.00	721.50	643.50	
		PAYMENTS					
		COMMITMENTS		224.25			
		UNENCUMBERED	195.00	165.75	721.50	643.50	
400-433	WOODLAND IMPROVEMENT						
		APPROPRIATED	260.00	1,859.00	2,821.00	2,990.00	
		PAYMENTS					
		COMMITMENTS		368.00			
		UNENCUMBERED	260.00	1,491.00	2,821.00	2,990.00	
400-434	WOODLAND PRUNING						
		APPROPRIATED		45.00	598.50	331.50	
		PAYMENTS					
		COMMITMENTS			552.00		
		UNENCUMBERED		45.00	46.50	331.50	
	INCENTIVE PAYMENTS TOTALS						
		APPROPRIATED	96,480.00	174,525.00	248,420.00	237,600.00	2,975.00
		PAYMENTS	43,009.36				
		COMMITMENTS	6,429.30	14,103.15	5,766.70	1,756.20	1,324.20
		UNENCUMBERED	47,041.34	160,421.85	242,653.30	235,843.80	1,650.80

ACCOUNT NO.	TITLE	FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
	*** TOTALS ***					
999-999	RECEIPTS FROM FED. GOVERN					
	APPROPRIATED	95,237.24				
	PAYMENTS	82,787.14				
	COMMITMENTS					
	UNENCUMBERED	12,450.10				

ACCOUNT NO.	TITLE	FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
	OVERALL TOTALS					
	APPROPRIATED	287,990.00	413,338.00	483,546.00	462,268.00	197,547.00
	PAYMENTS	82,787.14				
	COMMITMENTS	6,429.30	14,103.15	5,766.70	1,756.20	1,324.20
	UNENCUMBERED	198,773.56	399,234.85	477,779.30	460,511.80	196,222.80

TOTAL IN-KIND SERVICES TO DATE THIS PERIOD $ 13,807.71 GRANT AVAILABILITY $ 41,423.13

SOIL & WATER CONSERVATION

DATE 12/28/73 — OUTSTANDING COMMITTMENTS LISTING —

P.O	KEY NO	ARTICLES OR SERVICES	P.O. DATE	1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR
400-401	CONSERVATION CROPPING SYSTEM			85.00	1,928.55	2,570.75	2,148.25	500.00
000	2700150007	VINCE GEISTWHITE	07/12/73		19.20			
000	2700290004	JOSEPH R GRABER	08/03/73		62.40			
000	2100060014	BRUCE YERKS	08/31/73		27.60			
000	2100060003	RICHARD YERKS	08/31/73		145.20			
000	2100060007	VIRGIL HIRSCH	10/02/73		205.20			
	TOTAL PAID							
	TOTAL COMMITTED				459.60			
	TOTAL UNENCUMBERED BALANCE			85.00*	1,468.95*	2,570.75*	2,148.25*	500.00*
400-402	CONTOUR FARMING				266.50	354.90	278.30	100.00
000	2100060007	VIRGIL HIRSCH	10/02/73					16.00
000	2100060007	VIRGIL HIRSCH	10/02/73			16.00		
	TOTAL PAID							
	TOTAL COMMITTED					16.00		16.00
	TOTAL UNENCUMBERED BALANCE			*	266.50*	338.90*	278.30*	84.00*
400-403	CRITICAL AREA PLANTING			2,260.00	520.00	1,040.00	780.00	
000	2700150007	VINCE GEISTWHITE	07/12/73	520.00				
	TOTAL PAID			960.00				
	TOTAL COMMITTED			520.00				
	TOTAL UNENCUMBERED BALANCE			780.00*	520.00*	1,040.00*	780.00*	*
400-405	DIVERSIONS			1,845.00	2,250.00	4,387.50	4,257.50	
001	2100060007	VIRGIL HIRSCH	10/02/73	240.00				
002	2100060007	VIRGIL HIRSCH	10/02/73	1,500.00				
	TOTAL PAID							
	TOTAL COMMITTED			1,740.00				
	TOTAL UNENCUMBERED BALANCE			105.00*	2,250.00*	4,387.50*	4,257.50*	*
400-407	FIELD BORDER			2,875.00	9,114.00	19,985.55	21,247.85	
000	2700290004	JOSEPH R GRABER	08/03/73		147.00			
000	2100060014	BRUCE YERKS	08/31/73		294.00			
000	2100060003	RICHARD YERKS	08/31/73		2,184.00			
000	2100060007	VIRGIL HIRSCH	10/02/73			441.00		
000	2100060007	VIRGIL HIRSCH	10/02/73		966.00			
000	2700290046	MR & MRS GAY MARTIN	11/06/73		199.50			
	TOTAL PAID							
	TOTAL COMMITTED				3,790.50	441.00		
	TOTAL UNENCUMBERED BALANCE			2,875.00*	5,323.50*	19,544.55*	21,247.85*	*
400-408	FIELD WINDBREAK				104.00	138.45	147.55	
000	2700150007	VINCE GEISTWHITE	07/12/73		80.00			
	TOTAL PAID							
	TOTAL COMMITTED				80.00			
	TOTAL UNENCUMBERED BALANCE			*	24.00*	138.45*	147.55*	*
400-409	GRADE STABILIZATION STRUCTURES			10,850.00	28,600.00	38,025.00	42,125.00	
000	2100060003	RICHARD YERKS	08/31/73		1,125.00			

P.O	KEY NO	ARTICLES OR SERVICES	P.O. DATE	1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR	
001	2100960007	VIRGIL HIRSCH	10/02/73		513.00				
001	2100960007	VIRGIL HIRSCH	10/02/73	256.50					
001	2100960007	VIRGIL HIRSCH	10/02/73				256.00		
002	2100960007	VIRGIL HIRSCH	10/02/73	750.00					
	TOTAL PAID			9,405.45					
	TOTAL COMMITTED			1,006.50	1,638.00		256.00		
	TOTAL UNENCUMBERED BALANCE			438.05*	26,962.00*	38,025.00*	41,869.00*		*
400-410	GRASSED WATERWAY OR OUTLET			7,132.50	5,265.00	2,520.00	4,972.50		
000	2100960007	VIRGIL HIRSCH	10/02/73		504.00				
000	2100960007	VIRGIL HIRSCH	10/02/73				108.00		
000	2700290004	JOSEPH R GRABER	12/05/73		1,006.56				
	TOTAL PAID			5,512.44					
	TOTAL COMMITTED				1,510.56		108.00		
	TOTAL UNENCUMBERED BALANCE			1,620.06*	3,754.44*	2,520.00*	4,864.50*		*
400-411	HOLDING PONDS & TANKS			3,640.00	7,280.00	14,560.00	14,560.00		
000	2700150007	VINCE GEISTWHITE	07/12/73			2,800.00			
	TOTAL PAID								
	TOTAL COMMITTED					2,800.00			
	TOTAL UNENCUMBERED BALANCE			3,640.00*	7,280.00*	11,760.00*	14,560.00*		*
400-413	LIVESTOCK EXCLUSION			3,235.00	8,279.05	9,081.85	11,449.10		
000	2700150007	VINCE GEISTWHITE	07/12/73			384.00			
000	2700290004	JOSEPH R GRABER	08/03/73	2,444.80					
000	2700290046	MR & MRS GAY MARTIN	11/06/73		128.00				
	TOTAL PAID								
	TOTAL COMMITTED			2,444.80	128.00	384.00			
	TOTAL UNENCUMBERED BALANCE			790.20*	8,151.05*	8,697.85*	11,449.10*		*
400-414	LIVESTOCK WATERING FACILITY			760.00	650.00	670.00	1,560.00		
000	2700290046	MR & MRS GAY MARTIN	11/06/73		210.00				
	TOTAL PAID			420.00					
	TOTAL COMMITTED				210.00				
	TOTAL UNENCUMBERED BALANCE			340.00*	440.00*	670.00*	1,560.00*		*
400-415	MINIMUM TILLAGE			67.50	8,622.90	11,501.10	7,980.10	1,200.00	
000	2700150007	VINCE GEISTWHITE	07/12/73				83.20		
000	2700150007	VINCE GEISTWHITE	07/12/73		83.20				
000	2700150007	VINCE GEISTWHITE	07/12/73					83.20	
000	2700150007	VINCE GEISTWHITE	07/12/73			83.20			
000	2100960014	BRUCE YERKS	08/31/73		119.60				
000	2100960014	BRUCE YERKS	08/31/73				119.60		
000	2100960014	BRUCE YERKS	08/31/73			119.60			
000	2100960014	BRUCE YERKS	08/31/73					119.60	
000	2100960003	RICHARD YERKS	08/31/73		629.20				
000	2100960003	RICHARD YERKS	08/31/73					629.20	
000	2100960003	RICHARD YERKS	08/31/73				629.20		
000	2100960003	RICHARD YERKS	08/31/73			629.20			

OUTSTANDING COMMITTMENTS LISTING

P.O	KEY NO	ARTICLES OR SERVICES	P.O. DATE	1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR
000	2100060007	VIRGIL HIRSCH	10/02/73				187.20	
000	2100060007	VIRGIL HIRSCH	10/02/73			187.20		
000	2100060007	VIRGIL HIRSCH	10/02/73		187.20			
000	2100060007	VIRGIL HIRSCH	10/02/73					187.20
	TOTAL PAID							
	TOTAL COMMITTED				1,019.20	1,019.20	1,019.20	1,019.20
	TOTAL UNENCUMBERED BALANCE			67.50*	7,603.70*	10,481.90*	6,960.90*	180.80*
400-416	PASTURE & HAYLAND MANAGEMENT			234.00	1,017.90	1,673.10	1,778.40	
002	2700290004	JOSEPH R GRABER	08/03/73		362.70			
001	2700290004	JOSEPH R GRABER	08/03/73			175.50		
000	2700290046	MR & MRS GAY MARTIN	11/06/73			90.00		
	TOTAL PAID							
	TOTAL COMMITTED				362.70	265.50		
	TOTAL UNENCUMBERED BALANCE			234.00*	655.20*	1,407.60*	1,778.40*	*
400-417	PASTURE & HAYLAND PLANTING			2,275.00	5,642.00	7,507.50	7,371.00	
000	2700290004	JOSEPH R GRABER	08/03/73		735.00			
000	2700290046	MR & MRS GAY MARTIN	11/06/73		245.00			
	TOTAL PAID							
	TOTAL COMMITTED				980.00			
	TOTAL UNENCUMBERED BALANCE			2,275.00*	4,662.00*	7,507.50*	7,371.00*	*
400-418	POND			4,250.00	12,000.00	22,750.00	24,375.00	
002	2700290046	MR & MRS GAY MARTIN	11/06/73		75.00			
001	2700290046	MR & MRS GAY MARTIN	11/06/73		1,491.84			
	TOTAL PAID			2,814.48				
	TOTAL COMMITTED				1,566.84			
	TOTAL UNENCUMBERED BALANCE			1,435.52*	10,433.16*	22,750.00*	24,375.00*	*
400-420	RECREATION AREA IMPROVEMENT			500.00	890.00	520.00	650.00	
000	2700150007	VINCE GEISTWHITE	07/12/73	200.00				
000	2100060003	RICHARD YERKS	08/31/73		500.00			
000	2100060007	VIRGIL HIRSCH	10/02/73		200.00			
	TOTAL PAID			174.29				
	TOTAL COMMITTED			200.00	700.00			
	TOTAL UNENCUMBERED BALANCE			125.71*	190.00*	520.00*	650.00*	*
400-422	CONSERVATION FIELD TRIALS			275.00	675.00	675.00	675.00	675.00
000	2100060007	VIRGIL HIRSCH	10/02/73			100.00		
000	2100060007	VIRGIL HIRSCH	10/02/73				100.00	
000	2100060007	VIRGIL HIRSCH	10/02/73					100.00
000	2100060007	VIRGIL HIRSCH	10/02/73		100.00			
	TOTAL PAID							
	TOTAL COMMITTED				100.00	100.00	100.00	100.00
	TOTAL UNENCUMBERED BALANCE			275.00*	575.00*	575.00*	575.00*	575.00
400-426	SURFACE DRAINS			780.00	6,273.15	8,364.20	8,112.65	

P.O	KEY NO	ARTICLES OR SERVICES	P.O. DATE	1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR
	TOTAL PAID							
	TOTAL COMMITTED				175.00			
	TOTAL UNENCUMBERED BALANCE			780.00*	6,098.15*	8,364.20*	8,112.65*	*
400-429	TILE DRAINS			18,181.00	13,004.75	15,094.70	5,410.00	
000	2100060007	VIRGIL HIRSCH	10/02/73	518.00				
000	2100060007	VIRGIL HIRSCH	10/02/73		504.00			
000	2100060007	VIRGIL HIRSCH	10/02/73				84.00	
	TOTAL PAID			15,890.77				
	TOTAL COMMITTED			518.00	504.00		84.00	
	TOTAL UNENCUMBERED BALANCE			1,772.23*	12,500.75*	15,094.70*	5,326.00*	*
400-431	WILDLIFE HABITAT MANAGEMENT				2,684.50	3,594.50	3,822.00	
000	2700150007	VINCE GEISTWHITE	07/12/73		22.75			
000	2700290046	MR & MRS GAY MARTIN	11/06/73		74.75			
	TOTAL PAID							
	TOTAL COMMITTED				97.50			
	TOTAL UNENCUMBERED BALANCE			*	2,587.00*	3,594.50*	3,822.00*	*
400-432	WOODLAND IMPROVED HARVESTING			195.00	390.00	721.50	643.50	
000	2100060003	RICHARD YERKS	08/31/73		195.00			
000	2100060014	BRUCE YERKS	08/31/73		29.25			
	TOTAL PAID							
	TOTAL COMMITTED				224.25			
	TOTAL UNENCUMBERED BALANCE			195.00*	165.75*	721.50*	643.50*	*
400-433	WOODLAND IMPROVEMENT			260.00	1,859.00	2,821.00	2,990.00	
000	2100060003	RICHARD YERKS	08/31/73		320.00			
000	2100060014	BRUCE YERKS	08/31/73		48.00			
	TOTAL PAID							
	TOTAL COMMITTED				368.00			
	TOTAL UNENCUMBERED BALANCE			260.00*	1,491.00*	2,821.00*	2,990.00*	*
400-434	WOODLAND PRUNING				45.00	598.50	331.50	
000	2100060003	RICHARD YERKS	08/31/73			480.00		
000	2100060014	BRUCE YERKS	08/31/73			72.00		
	TOTAL PAID							
	TOTAL COMMITTED					552.00		
	TOTAL UNENCUMBERED BALANCE			*	45.00*	46.50*	331.50*	*

******** C H E C K W R I T T E N F I L E U P D A T E ********

ACCT-NO	PO-NUMBER	PAYOR OF CLAIM	CHECK-AMT
600-101	0	TOTAL DISTRICT SALARY & WAGES	381.30
600-101	0	TOTAL DISTRICT FRINGE BENEFITS	45.45
600-101	0	TOTAL DISTRICT FRINGE BENEFITS	42.30
600-101	0	TOTAL DISTRICT SALARY & WAGES	368.20
600-101	0	TOTAL DISTRICT SALARY & WAGES	363.10
600-101	0	TOTAL DISTRICT FRINGE BENEFITS	39.15
600-101	0	TOTAL DISTRICT SALARY & WAGES	370.00
600-101	0	TOTAL DISTRICT FRINGE BENEFITS	41.40
600-108	0	5 HRS @ $10.05 HR	50.25
600-201	0	BROOKS-PURDUE SALARY & WAGES	499.53
600-201	0	PURDUE SALARY & WAGES	2,609.12
600-201	0	MCCAFFERTY PURDUE SALARY	416.93
600-202	0	BROOKS-PURDUE FRINGE BENEFITS	104.49
600-202	0	PURDUE FRINGE BENEFITS	442.18
600-202	0	MCCAFFERTY PURDUE FRINGE BENEF	85.95
600-209	0	BROOKS-PURDUE INDIRECT COSTS	321.46
600-209	0	PURDUE INDIRECT COSTS	1,677.69
600-209	0	MCCAFFERTY PURDUE IND COSTS	268.09
600-409	0	RAY MILLER	80.00
600-409	0	DRAINAGE ASSOC	40.00
600-409	0	JESTER CONSTRUCTION COMPANY	537.50
600-409	0	JESTER CONSTRUCTION COMPANY	745.00
600-409	0	JESTER CONSTRUCTION COMPANY	175.95
600-409	0	JESTER CONSTRUCTION COMPANY	97.00

******** C H E C K W R I T T E N F I L E U P D A T E ********

ACCT-NO	PO-NUMBER	PAYOR OF CLAIM	CHECK-AMT
600-409	0	JESTER CONSTRUCTION COMPANY	15.80
600-409	0	JESTER CONSTRUCTION COMPANY	275.00
600-409	0	JESTER CONSTRUCTION COMPANY	20.00
600-410	0	RAY MILLER	64.00
600-410	0	RAY MILLER	18.00
600-410	0	JESTER CONSTRUCTION COMPANY	80.00
600-421	0	JOE GRABER	471.87
600-423	0	JESTER CONSTRUCTION COMPANY	449.00
600-424	0	JESTER CONSTRUCTION COMPANY	1,500.00
600-424	0	JESTER CONSTRUCTION COMPANY	202.50
600-424	0	JESTER CONSTRUCTION COMPANY	300.00
600-429	0	RAY MILLER	127.00
600-429	0	JESTER CONSTRUCTION COMPANY	418.50
600-429	0	JESTER CONSTRUCTION COMPANY	64.00

PRIOR TRANSACTIONS AMOUNT **********23,289.39 CURRENT TRANSACTIONS AMOUNT **********37,097.10

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

FOR PERIOD BEGINNING 08/30/73 AND ENDING 10/29/73

ACCOUNT NO	DATE	BY WHOM RENDERED	KIND OF SERVICE AND ITEMIZATION	AMOUNT	VOCHER
600 101	08/31/73	TOTAL DISTRICT	SALARY & WAGES	381.30	004
600 101	08/31/73	TOTAL DISTRICT	FRINGE BENEFITS	45.45	004
600 101	09/15/73	TOTAL DISTRICT	FRINGE BENEFITS	42.30	004
600 101	09/15/73	TOTAL DISTRICT	SALARY & WAGES	368.20	004
600 101	09/30/73	TOTAL DISTRICT	SALARY & WAGES	363.10	004
600 101	09/30/73	TOTAL DISTRICT	FRINGE BENEFITS	39.15	004
600 101	10/15/73	TOTAL DISTRICT	SALARY & WAGES	370.00	004
600 101	10/15/73	TOTAL DISTRICT	FRINGE BENEFITS	41.40	004
600 108	02/01/73	5 HRS @ $10.05 HR		50.25	004
				1,701.15	

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

FOR PERIOD BEGINNING 09/30/73 AND ENDING 10/29/73

ACCOUNT NO	DATE	BY WHOM RENDERED	KIND OF SERVICE AND ITEMIZATION	AMOUNT	VOCHER
600 201	04/30/73	BROOKS-PURDUE	SALARY & WAGES	499.53	004
600 201	04/30/73	PURDUE	SALARY & WAGES	2,609.12	004
600 201	07/31/73	MCCAFFERTY PURDUE	SALARY	416.93	004
600 202	04/30/73	BROOKS-PURDUE	FRINGE BENEFITS	104.49	004
600 202	04/30/73	PURDUE	FRINGE BENEFITS	442.18	004
600 202	07/31/73	MCCAFFERTY PURDUE	FRINGE BENEF	85.95	004
600 209	04/30/73	BROOKS-PURDUE	INDIRECT COSTS	321.46	004
600 209	04/30/73	PURDUE	INDIRECT COSTS	1,677.69	004
600 209	07/31/73	MCCAFFERTY PURDUE	IND COSTS	268.09	004
				6,425.44	

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

FOR PERIOD BEGINNING 08/30/73 AND ENDING 10/29/73

ACCOUNT NO	DATE	BY WHOM RENDERED	KIND OF SERVICE AND ITEMIZATION	AMOUNT	VOCHER
600 409	09/14/73	RAY MILLER		80.00	004
600 409	09/19/73	DRAINAGE ASSOC		40.00	004
600 409	10/01/73	JESTER CONSTRUCTION COMPANY		537.50	004
600 409	10/01/73	JESTER CONSTRUCTION COMPANY		745.00	004
600 409	10/01/73	JESTER CONSTRUCTION COMPANY		175.95	004
600 409	10/01/73	JESTER CONSTRUCTION COMPANY		97.00	004
600 409	10/05/73	JESTER CONSTRUCTION COMPANY		15.80	004
600 409	10/05/73	JESTER CONSTRUCTION COMPANY		275.00	004
600 409	10/05/73	JESTER CONSTRUCTION COMPANY		20.00	004
600 410	09/14/73	RAY MILLER		64.00	004
600 410	09/14/73	RAY MILLER		18.00	004
600 410	10/05/73	JESTER CONSTRUCTION COMPANY		80.00	004
600 421	10/01/73	JOE GRABER		471.87	004
600 423	10/01/73	JESTER CONSTRUCTION COMPANY		449.00	004
600 424	10/01/73	JESTER CONSTRUCTION COMPANY		1,500.00	004
600 424	10/01/73	JESTER CONSTRUCTION COMPANY		202.50	004
600 424	10/01/73	JESTER CONSTRUCTION COMPANY		300.00	004
600 429	09/14/73	RAY MILLER		127.00	004
600 429	10/05/73	JESTER CONSTRUCTION COMPANY		418.50	004
600 429	10/05/73	JESTER CONSTRUCTION COMPANY		64.00	004
				5,681.12	

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

FOR PERIOD BEGINNING 08/30/73 AND ENDING 10/29/73

ACCOUNT NO	DATE	BY WHOM RENDERED	KIND OF SERVICE AND ITEMIZATION	AMOUNT
				13,807.71
				13,825.99

CONSERVATION PRACTICE SPECIFICATIONS

Practice	Practice Number
Conservation Cropping System (Acres)	328
Contour Farming (Acres)	330
Critical Area Planting (Acres)	342
Mulching (Acres)	484
Crop Residue Management (Acres)	344
Diversion (Feet)	362
Farmstead & Feedlot Windbreaks (Acres)	380
Field Border (Feet)	386
Field Windbreaks (Feet)	392
Grade Stabilization Structure (Number)	410
Grassed Waterway or Outlet (Acres)	412
Holding Ponds & Tanks (Number)	425
Land Smoothing	466
Livestock Exclusion (Acres)	472
Fencing	382
Livestock Watering Facility (Number)	614
Minimum Tillage	478
Pasture & Hayland Management (Acres)	510
Pasture & Hayland Planting (Acres)	512
Pond (Number)	378
Land Protected During Development (Number & Acres)	689
Recreation Area Improvement (Acres)	562
Sediment Control Basin (Number)	350
Stream Channel Stabilization	584
Streambank Protection (Feet)	580
Stripcropping, Contour (Acres)	585
Surface Drains (Feet)	590
Terraces, Gradient (Feet)	600
Terraces, Parallel (Feet)	604
Tile Drains (Feet)	606
Tree Planting (Acres)	612
Wildlife Wetland Habitat Management (Acres)	644
Wildlife Upland Habitat Management (Acres)	645
Woodland Improved Harvesting (Acres)	654
Woodland Improvement (Acres)	666
Woodland Pruning (Acres)	660

328 CONSERVATION CROPPING SYSTEM (Acres)

Definition

Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

Purpose

1. To meet the needs of the soil for maintenance and improvement.

2. To protect the soil against erosion and other deterioration.

3. Fulfill the needs and desires of the land operator for economic return.

Where Applicable

On all cropland.

Specifications

1. A crop rotation or crop sequence is planned.

2. Erosion by water and wind is controlled by planning needed conservation practices and applicable cultural and management items. The Universal Soil Loss Equation (Section III-B, SCS Technical Guide) will be used as a guide in determining adequacy of control of erosion caused by water. The wind erosion equation will be used to design wind erosion control systems.

3. Needed grass and/or legume seedings are planned, according to "Work Unit Guide of Grass and Legume Seedings for Cropland," (Section III-B-2, SCS Technical Guide.)

4. The fertility program in use, or planned to be used, is adequate for application of a sound conservation program on the operating unit.

   Note: "adequate fertility program" is one which will support average crop yields, and when used with needed conservation practices, erosion will be controlled within tolerant soil losses.

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5. Intensive row cropping may be planned when:

   a. The soils are level to nearly level and erosion is not a problem, or on sloping land, erosion control is planned as indicated under Item 2 of these specifications.

   b. The soils have good structure, with adequate drainage for the yield level planned.

   c. Skillful management is used in applying cultural and management items. This includes fertilization, minimum tillage operations, use of crop residues and cover crops, timeliness of operations, etc.

   d. An occasional grass-legume seeding is inserted in the cropping sequence, when satisfactory yield levels are not maintained.

6. Apply field drainage needs as designated in the Indiana Drainage Guide.

7. Waterways shall be installed in areas where there is concentrated flow.

8. Where irrigation is to be used, consult the Indiana Irrigation Guide.

Cost Sharing

Cost share, when planned and applied according to above specifications, will be 80% of the average cost of $1.50 per acre.

Unit Price = $1.50 per acre
Cost share rate = $1.20 per acre

Except: Where three or more years of grasses and legumes in rotation are needed and planned, initial establishment of the seedings will be cost shared on the basis of practice 512, pasture and hayland planting.

Practice will be eligible for payment after the establishment of the crop in the first year of the rotation.

330 CONTOUR FARMING (Acres)

Definition

Farming sloping cultivated land in such a way that plowing, preparing and planting, and cultivating are done on the contour. (This includes following established grades of terraces, diversions, or contour strips.)

Purpose

To reduce soil and water losses, and aid in the maintenance of other practices.

Where Applicable

On sloping cropland where other practices in the cropping system do not reduce soil and water losses to the desired level.

Specifications

1. The Universal Soil Loss Equation shall be used to determine adequacy of erosion control with contouring.

2. On terraced land or where diversions are used, the ridge will serve as a contour guide line. On contour strip cropped land, the key strip lines will serve as guides.

3. Guide lines shall be laid approximately on the contour. Deviation shall not be more than 3 percent in any 100-foot length.

4. Guide lines for soils with tight subsoils shall be established on a slight grade (0.5 to 1 percent) toward grass waterways.

5. Planting shall start on guide line and progress toward the center (between guide lines) where short rows, if any, shall be placed.

6. Existing watercourses shall be left in sod and new waterways established where needed.

Cost Sharing

Cost share, when planned and applied according to the above specifications, will be 80% of the average cost of $2.00 per acre.

Unit Price = $2.00 per acre
Maximum Cost Share = $1.60 per acre

Practice will be eligible for payment after the contours are laid out and after the first crop is planted, on the contour.

342 CRITICAL AREA PLANTING (Acres)

Definition

Stabilizing silt-producing and severly eroded areas by establishing vegetative cover. This includes woody plants, such as trees, shrubs or vines, and adapted grasses or legumes established by seeding or sodding to provide long-term ground cover. (Does not include Tree Planting mainly for the production of wood products.)

Purpose

To stabilize eroded areas, to reduce damages from sediment and runoff to downstream areas, improve wildlife habitat, and enhance the beauty of the countryside.

Where Applicable

On highly erodible or severly eroded areas such as denuded or gullied areas where vegetation is difficult to establish with normal seeding methods.

Specifications

A. Adapted grasses and legumes seeding

1. Seedbed preparation

   a. Gullied and severely eroded area may need smoothing before attempting to prepare seedbed.
   b. Lime to raise pH to level needed for species being seeded.
   c. Use the minimum amount of tillage operations to obtain adequate seedbed.
   d. Fertilize at rate of 600 lbs. 12-12-12 per acre or equivalent (minimum of 72 lbs. actual N-P-K per acre).

2. Seedings

   Seeding will generally be done from March 1 to May 10 and August 10 to September 30. Mixtures with sericea lespedeza and crownvetch are best spring seeded.

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Dormant seeding may be done between December 10 and February 28. Liming, fertilizing, seedbed preparation and mulching may be done ahead of time of dormant seeding, with the seed being broadcast on top of the mulch. See specification 484-Mulching.

Use species adapted to site conditions. Some suggested seedings are:

CRITICAL AREA SEEDING MIXTURES

Species	Seeding Rate lbs./ acre	Seeding Rate lbs/1000 sq.ft.	Suitable pH	* Site Suitability Droughty	Well Drained	Wet
1. Smooth Bromegrass	20	1/2	5-8	2	1	
plus:						
Redtop or	5	1/8				
Perennial Ryegrass	5	1/8				
x2. Tall Fescue	15-20	3/8-1/2	5.5-8.3	2	1	
Crownvetch	10	1/4				
3. Tall Fescue	20	1/2	4.5-8.3	1	1	
Sericea Lespedeza	25	5/8				
x4. Tall Fescue	30	3/4	5.5-8.3	2	1	2
5. Reed Canarygrass	15	3/8	5.5-7.5	2	1	1
Ladino Clover	1-2	1/40-1/20				
x6. Ky. Bluegrass	15-20	3/8-1/2	5.8-7.5	2	1	2
plus:						
Redtop or	5	1/8				
Perennial Ryegrass	5	1/8				

* 1/ Preferred; 2/ Will tolerate
x Use on pond fills and borrow areas. Mixture 6 may be used where pond fills will be frequently and closely mowed.

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3. Mulch with 2 tons of straw or equivalent material. See Specifications "484 Mulching" attached.

B. Adapted tree, shrub and vine plantings

1. Follow Indiana Tree Planting Guide and Shrub Planting Guide for the proper species, spacing and the important techniques of planting and management.

2. When making plantings, particularly beneficial to wildlife, refer to the appropriate specifications as outlined in Practice 645, Wildlife Development.

3. Tree, shrub and vine plantings for critical areas and beautification.

Purpose, Use, and Aesthetic Value	Species	Spacing	Growth Rate & Height	Tolerance Sun	Tolerance Shade	Drainage Required Poor	Drainage Required Well
SHADE AND ORNAMENTAL TREES:							
Evergreen							
	White Pine	65'	M-90'	X		2	1
	Red Pine	65'	M-75'	X			2
	Jack Pine	40'	F-40'	X		2	1
Deciduous							
White flowers	Black Locust	40'	F-30'	X			1
Bright red coloration	Black Gum	40'	M-50'	X	X	2	1
Yellow coloration	Thornless Honeylocust	50'	F-40'	X			1
Yellow coloration	Europ.Bl.Alder	40'	F-40'	X		2	1
SHRUBS:							
White flowers-red color	Dogwood	8'x10'	S-20'	X	X		1
Pink flowers	Redbud	8'x10'	M-15'	X			1
Yellow flowers	Forsythia	8'x10'	F- 8'	X			1
Red coloration	Suma-Smooth or Staghorn	Clumps 2 or 3 8'-10'	F-10'	X			1
Red fruit	Coralberry	6'- 8'	F- 5'	X	X	2	1
Silver leaves-red fruit	Autumn Olive	8'-10'	M-10'	X			1

All spacing of trees and shrubs shown on the previous [illegible] is to show the plants' beauty, and not for erosion control.

Any of the previous plants when used on critical areas must have an overseeding of adapted grass and legumes for soil stabilization.

Ground Cover Plant (Vine Type)	Spacing	Growth Rate & Height	Tolerance Sun	Tolerance Shade	Drainage Required Poor	Drainage Required Well
Ground Myrtle (Vica Minor)	2'	F-1/2'		X	2	1
Japanese Honeysuckle	6'	F-1'	X	X		1

Follow "Critical Area Planting" specifications for plant establishment, fertility treatment, and maintenance.

Cost-Sharing

Cost-share, when planned and applied according to the above specifications, will be as follows:

1. Where control is accomplished by planting of adapted grasses and legumes, cost-share will be 65% of the actual costs involved not to exceed 65% of the estimated cost.

Unit Price = $400.00 per acre
Maximum Cost-Share = $260.00 per acre

2. When trees and/or shrubs are planned and established in combination with grass and legume seedings, cost-share will be 80% of the actual costs involved not to exceed 80% of the estimated cost.

Unit Price = $400.00 per acre
Maximum Cost-Share = $320.00 per acre

NOTE: The protection from livestock is needed to successfully establish critical area plantings, fencing as planned and installed will be cost-shared in accordance with practice 472 Livestock Exclusion. Practice will be eligible for payment when seeding is completed.

484 MULCHING (Acres)

Definition

Applying plant residues or other suitable materials not produced on the site to the soil surface.

Purpose

To conserve moisture, absorb rainfall impact and prevent soil compaction and crusting, to reduce runoff and erosion, to help establish new seedings, control weeds and improve the physical condition of the soils.

Where Applicable

On soils subject to severe erosion where a small amount of vegetation cover or crop residue is produced, such as critical areas and some orchards and vineyards; on soils that have a low infiltration rate; on soils excavated in construction, both cut and fill areas, and on new seedings.

Specifications

Critical areas where grass and/or legumes are to be seeded.

Apply approximately 1-1/2 to 2 tons of dry material per acre or 2 bales per 1000 sq. ft. (straw, hay, etc.) to the surface after fertilizing and seeding. (Eight tons of manure will have about the same effect as two tons of straw).

When structures are completed too late for normal seeding and too early for dormant seeding to be made: apply lime, fertilizer, prepare seedbed and mulch and secure the mulch in place immediately after completion of the structure. Delay seeding until after potential for fall germination is past, then broadcast seed on the surface by some type of hand seeder.

Spread evenly over the area.

Anchor the mulching material by disking into the surface, by stakes and string, asphalt spray or paper netting.

Cost-share for mulching is included in those practices where mulching is required.

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344 CROP RESIDUE MANAGEMENT (Acres)

Definition

Using plant residues to protect cultivated fields during critical erosion periods.

Purpose

To conserve moisture, increase infiltration, reduce soil losses, and improve soil tilth.

Where Applicable

On cropland where adequate crop residues are produced.

Specifications

1. Amount of crop residues left on surface.

   Crop residues are left on the surface during critical erosion periods in the amount designated as required by the conservation cropping system (reference is made to the water and wind erosion equations).

2. Management of residues.

   The residue may be chiseled or disked in the fall, winter, or spring prior to planting providing the quantity of residue left on the surface after tillage is adequate to meet requirements uner Item 1. If residues are plowed under, they shall not be plowed under prior to one month before planting.

   (See also, specifications for minimum tillage - no plow methods).

   (Rule of thumb on amount of residues: One ton of residue will be produced for each 35 bushel yield of corn; 20 bushel wheat; 40 bushel oats; and 40 bushel soybeans).

Cost-Sharing

Cost-share when planned and applied according to the above specifications will be 70% of the average cost of $1.50 per acre.

Unit Price = $1.50 per acre
Maximum Cost Share = $1.05 per acre

Practice will be eligible for payment just prior to planting of the next years crop.

362 DIVERSION (Feet)

Definition

A channel with a supporting ridge on the lower side constructed across the slope.

Scope

This standard covers the installation of all diversions except floodwater diversions.

Purpose

The purpose of this practice is to divert water from areas where it is in excess to sites where it can be used or disposed of safely.

Conditions Where Practice Applies

This practice applies to sites where:

1. Runoff from higher lying areas is damaging cropland, pastureland, farmsteads, or conservation practices such as terraces or stripcropping.

2. Surface and shallow subsurface flow is damaging sloping upland.

3. Runoff is available for diversion and use on nearby sites.

4. Required as a part of a pollution abatement system, or to control erosion and runoff on urban or developing areas and construction sites.

Diversion shall not be substituted for terraces on land requiring terracing for erosion control.

Diversions are not usually applicable below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversions.

Design Criteria

General

Diversions shall be designed according to the procedures found in Chapter 9, SCS Engineering Field Manual.

Capacity

Diversions protecting agricultural land and those that are part of a pollution abatement system must have the capacity to carry the peak runoff from a 10-year-frequency storm as a minimum, with a freeboard not less than 0.3 feet. Diversions designed to protect urban areas, buildings and roads, and those designed to function in connection with other structures, shall have enough capacity to carry the peak runoff expected from a storm frequency with the hazard involved.

Cross Section

The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes; no steeper than 4:1 on field slopes up to 15 percent and on field slopes over 15 percent, no steeper than 2:1. The ridge height will include a minimum of 15 percent for settlement. The ridge shall have a minimum top width of 4 feet at the design elevation. The minimum cross section shall meet the specified dimensions. The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement.

Location

Diversion location shall be determined by outlet conditions, topography, land use, cultural operations, soil type, and length of slope.

A diversion in a cultivated field must be aligned so as to permit the use of modern farming equipment.

Vegetation

The channel and ridge, including front and back slopes of all diversions shall be seeded and maintained in good vegetation. Adapted grasses and fertility rates for Practice 342, Critical Area Planting, shall be used.

Protection Against Sedimenation

In addition to vegetating the ridge and channel, a filter strip above the channel not less than 20 feet wide will be established and maintained in good sod when one or more of the following conditions exist:

1. The slope above the diversion exceeds 8 percent.

2. The design velocity (V_1) of the diversion is less than 3 feet per second.

3. Where concentrations of sediment can enter the waterway from watercourses or any other high sediment producing area.

Outlets

Each diversion must have an adequate outlet. The outlet may be a grassed waterway, vegetated or paved area, grade stabilization structure, stable watercourse, or tile outlet. In all cases the outlet must convey runoff to a point where outflow will not cause damage. Vegetative outlets shall be installed before diversion construction, if needed, to insure establishment of vegetative cover in the outlet channel.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Plans and Specifications

Plans and specifications for installation of diversion shall be in keeping with the standard and shall describe the requirements for application of the practice to achieve its intended purpose.

Construction

All dead furrows, ditches, or gullies to be crossed shall be filled before construction begins or as a part of construction. All old terraces, fence rows, or other obstructions that will interfere with the successful operation of the diversions shall be removed.

The minimum cross section shall meet the specified designed dimensions, but in no instance, be less than 8 square feet.

The top of the constructed ridge shall not be lower at any point than the designed elevation plus the specified overfill for settlement.

Final grade will be checked and corrected so that channel will drain and not leave pools of water which would drown out vegetation.

Cost-Sharing

1. Earth Moving

   Cost-share, when planned and applied according to the above specifications, will be 75% of the actual cost not to exceed 75% of the estimated cost.

Unit Price = $ .60 per cubic yard
Maximum Cost Share = 45¢ per cubic yard of earth moved

2. Seeding the Diversion and Required Filter Strip

Cost share, when carried out according to the above specifications will be 75 percent of the actual cost not to exceed 75 percent of the estimated cost.

Unit Price = $150.00 per acre
Maximum Cost Share = $112.50 per acre

3. Underground Outlet and Inlet System

Cost share when planned and constructed according to the above specifications will be 75 percent of the actual cost not to exceed 75 percent of the estimated cost.

Unit Price = $150.00 per inlet
Maximum Cost Share = $112.50 per inlet

Practice will be eligible for payment when diversion is completed and seeded.

380 FARMSTEAD AND FEEDLOT WINDBREAKS (Acres)

Definition

A belt of trees or shrubs established next to a farmstead or feedlot.

Purpose

To provide wind protection, control snow deposition, improve rural landscape, supply food and cover for wildlife, and supply shelter for livestock.

Where Applicable

1. Adjacent to farmsteads and rural homesites where wind erosion is likely to occur, and where rows of trees and/or shrubs will provide wind protection, and add landscape value.

2. To protect pasture areas of intensive grazing or feeding where windbreak will provide suitable wind protection for livestock.

3. On windbreak sides of rural schools, cemetaries, churches, recreation areas, etc., where wind protection can be accomplished for heavy use areas, and rural beauty can be added to otherwise barren sites.

Specifications

Site Location

1. Establish windbreaks on north and west sides of building or area needing wind protection.

2. Plant windbreak with inside edge 100 to 150 feet from center of building area.

Site Preparation

1. Heavy textured and organic soils: Fall plow, disk and [illegible] 1/2 to 3/4 bushel per acre of small grain.

2. Sandy textured soils: Lightly disk in early spring prior to planting.

Spacing of Trees and Shrubs

1. Keep trees and shrubs 8 feet or more from fences.

2. Space as follows: Evergreens - Rows 12' to 16' apart and trees 12' to 16' apart in the row.

   Shrubs - Rows 10' to 12' from evergreens and 3' to 4' apart in the row.

   Spacings are shown with variance in order to fit landowner cultivation equipment.

Planting and design

1. Establish windbreaks only in spring (March 15 to May 15).

2. Minimum requirement for Farmstead and Feedlot Windbreak will be 3 rows of plants, of which 2 rows must be tree species:

   The following combinations are recommended:

   A. One row shrubs on windward side and 2 rows of evergreen inside.

   B. One row of shrubs outside and another inside with 2 rows of evergreens in the middle. (4 row windbreaks)

   C. Three rows of evergreens.

3. Stagger spacing of evergreens in adjacent rows.

Planting Stock for Windbreaks

Trees -

White Pine - Good for windbreaks except on severely eroded sites.

Stock - Transplants - 2-2 or 2-1

Red Pine - Avoid wet sites and severe erosion areas.

Stock - Transplants - 2-1 or 2-2

American Arborvitae (Northern White-Cedar) - Good species for moist and fertile sites. When used with pines, it should be planted in outside rows.

Stock - Seedling or Transplant - 3-0 or 2-1

Norway S[illegible] - Suited to better soils, and slower in growth than pines. When planted with pines, place in windward row.

Stock - Transplants - 2-2

Jack Pine - Only on sandy soils where active blow problem exists. Use in outside row to protect better pines.

Stock - Seedlings - 1-0 or 2-0

Shrubs

Hazelnut (Filbert) - Dry and well drained upland sites.

Seedlings - 2-0

Autumn Olive - Stands wide range of sites.

Seedlings - 2-0

Multiflora Rose - Only in areas of intensive cultivation and where spread will be controlled. Avoid droughty sand areas.

Seedlings - 1-0

Lilacs - Used in most cases to add beauty to windbreaks. Avoid wet sites.

Seedlings and grafted stock - 2-0 or 3-0

Gray Dogwood
Red Osier Dogwood - Moist sites.

Seedlings - 2-0

Tartarian Honeysuckle - Most common of bush honeysuckles. Suited to planting on wide variety of sites.

Seedlings - 2-0

Amur Honeysuckle - Similar to Tartarian, will attain a greater height and retain fruit longer into winter.

Seedlings - 2-0

Trees and shrubs selected for windbreaks must be adapted to soil and site.

Place order for windbreak stock in fall for next year's planting. Order 10% more plants than required. Extras to be planted in garden for later replacement stock.

Maintenance

1. Fence, where needed, to protect plants from livestock damage.

2. Protect from fire, rodents, and harmful chemical spray.

3. Replant any dead plants the following spring.

4. Cultivate for several years until plants are well established.

Cost Sharing

Cost share, when planned and applied according to the above specifications will be 80% of the actual cost involved not to exceed 80% of the estimated cost.

Unit Price = $80.00 per acre
Maximum Cost Share = $64.00 per acre

Where protection from livestock is needed, fencing as planned and installed will be cost shared in accordance with practice 472, Livestock Exclusion.

Practice will be eligible for payment when trees are planted and protected.

Black Creek Study Area
Standards and Specifications
Allen Co. SWCD

386 FIELD BORDER (Feet)

Definition

A border or strip of perennial vegetation established at the edge of a field by planting grass-legume mixtures or by converting to herbaceous vegetation or shrubs.

Purpose

To control erosion; protect edges of fields and berms that are used as "turn rows" or travel lanes for farm machinery; reduce competition from adjacent woodland; provide wildlife food and cover; or improve the environment.

Where Applicable

At field edges, especially crop fields along open drains and edge of woodlands adjacent to cropland, roads, trails, rights-of-way, and woodland openings.

Specifications

Borders developed will be a minimum of one rod in width and will not include a part of a designed waterway or streambank section. Development of field borders by either of the two following methods are acceptable:

A. Grass-Legume Planting

1. Field borders will be at least one rod in width.

2. Use adapted perennial grasses, legumes, or grass-legume mixtures. See Standard and Specifications for Pasture and Hayland Planting. If field is plowed out of meadow, leave desired width of field border.

3. Delay mowing of field borders until after August 1. Hay may be removed at that time.

B. Shrub, or Shrub and Tree, or Grass and Tree Planting

1. Plant two rows of shrubs such as gray or silky dogwood or autumn olive along woodland edges and field borders. Space shrub rows 6 to 8 feet apart with plants 6 to 8 feet apart in row.

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2. Along stream channels black walnut may be planted in one row on a 12 foot spacing with shrubs alternating in the row making a 6 foot spacing. Next to the field, the second row of shrubs should be planted on a 6 to 8 foot spacing with rows 6 to 8 feet apart.

3. Along streams, a row of black walnut may be planted on a 12 foot spacing with adapted perennial grasses legumes or grass legume mixture. If trees and shrubs are transplanted into established sod, acceptable planting methods should be used to reduce grass competition around the tree seedlings.

4. The area included in the field border will be a minimum of 1 rod in width.

5. Seedlings and transplants will be planted by April 30. Balled plants by April 30 or October 30.

Caution

Chemicals used in performing this practice must be federally and locally registered, and must be applied strictly in accordance with authorized registered uses, directions on the label, and other federal or state policies and requirements.

Cost-Sharing

Cost-share, when planned and established according to the above specifications, will be 70% of the average cost of 30 cents per lineal foot.

Unit Price = 30 cents per lineal foot
Maximum Cost-Share = 21 cents per lineal foot

Practice will be eligible for payment when seeding is completed.

392 FIELD WINDBREAKS (Feet)

Definition

A strip or belt of trees or shrubs established within or adjacent to a field.

Purpose

To reduce soil blowing; control deposition; conserve moisture; protect crops and orchards.

To provide food, cover and travel lanes for wildlife in areas of intensive farming operations.

Contribute to reduction of air pollution, improve general enviroment and add to rural beauty.

Where Applicable

In or around open fields which need protection against wind damage to soils and crops.

Where strips of trees or shrubs increase the natural beauty of a rural community or provide additional cover and food for many species of wildlife.

Specifications

Plant generally in a north - south direction to give maximum protection from prevailing winds. Occasional east - west plantings are also needed on large areas of erosive soils, and in some specific sites.

The permanency of this practice makes it essential that rows be laid out and marked prior to planting. Careful layout will eliminate cultivation problems after planting.

The spacing between field windbreaks will vary with type of plants used in windbreak crop being protected, and erodibility of soil. Generally, the spacing of windbreaks should be a distance not greater than 15 - 20 times the effective height of materials being planted.

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Plants for Windbreaks and Spacing*

Species	Planting Spacing In Row Ft.	Expected Maximum Height Ft.	Size Stock	Allowable Distance Between Windbreaks Ft.
White Pine	8 - 10	80 - 90	2-1, 2-2	1,000 - 1,500
Red Pine	8 - 10	70 - 80	2-1, 2-2	1,000 - 1,500
Jack Pine	8 - 10	60 - 70	1-0	800 - 1,000
American Arborvitae	6 - 8	30 - 40	3-0, 2-1	500 - 1,000
Norway Spruce	8 - 10	70 - 80	2-2	1,000 - 1,500
Hazelnut (Filbert)	3 - 4	8 - 10	2-0	150 - 200
Autumn Olive	3 - 4	12 - 14	2-0	250 - 300
Multiflora Rose	2 - 3	8 - 10	1-0	150 - 200
Lilacs	3 - 4	10 - 12	2-0	200 - 250
Silkydogwood	3 - 4	15 - 20	2-0	300 - 400
Gray Dogwood	3 - 4	15 - 20	2-0	300 - 400
Red Osier Dogwood	3 - 4	15 - 20	2-0	300 - 400
Laurel-leaf Willow	3 - 4	30 - 40	Cuttings	600 - 800
Tall Purple Willow	3 - 4	15 - 20	Cuttings	300 - 400
Med. Purple Willow	3 - 4	12 - 15	Cuttings	250 - 300
Tartarian Honeysuckle	3 - 4	12 - 15	2-0	250 - 300
Amur Honeysuckle	3 - 4	15 - 20	2-0	300 - 400

NOTE: The woodland suitability groups for mapping units places together soil units where wind erosion presents a problem. The same groups provide a good base for assignment of suitable units for use in windbreaks.

* On specialty crops a closer spacing may be needed to adequately protect young growing plants.

Planting

1. Planting time will be from March 15 to May 15.

2. Plant in 1 or 2 rows. When 2 rows are used, plant 1 row with tree species, and the other row of shrubs. In a 2 row arrangement, shrubs should be located on windward side of windbreak.

3. When 2 row break is established, use height of tallest plants to figure allowable windbreak spacing.

Maintenance and Protection

1. Windbreaks must be protected at all times from fire, livestock, and chemical spray damage.

2. Cultivate the windbreak at the same time as cultivating field crops.

3. Replant any failure of plants the following spring.

Caution

Chemicals used in performing this practice must be federally and locally registered and must be applied strictly in accordance with authorized registered uses, directions on the label, and other federal or state policies and requirements.

Cost-Sharing

Cost-share, when planned and applied according to the above specifications, will be 80% of the average cost of 5 cents per lineal foot.

Unit Price = 5 cents per lineal foot
Maximum Cost-Share = 4 cents per lineal foot

Where protection from livestock is needed, fencing as planned and applied will be cost-shared in accordance with practice 472, Livestock Exclusion.

Practice will be eligible for payment when trees are planted and protected, if necessary.

410 GRADE STABILIZATION STRUCTURE (Number)

Definition

A structure to stabilize the grade or to control head cutting in natural or artificial channels.(Does not include straight pipe overfall structures used in irrigation systems or structures for water control). Tile outlet pipes will be eligible for cost-share.

Scope

This standard applies to all types of grade stabilization structures.

Purpose

Grade stabilization structures are installed to stabilize the grade in natural or artificial channels, prevent the formation or advance of gullies, and reduce environmental and pollution hazards.

Conditions Where Practice Applies

These structures apply where the concentration and flow velocity of water are such that structures are required to stabilize the grade in channels or to control gully erosion. Special attention will be given to maintaining or improving habitat for fish and wildlife, where applicable.

Design Criteria

Structures

Grade stabilization structures of materials such as concrete, rock, masonary, steel, aluminum and treated wood shall be designed in accordance with the principles outlined in the SCS Engineering Field Manual for Conservation Practices and the applicable SCS Engineering Memorandum.

Embankment

Earthfill embankments shall be designed as follows:

1. Embankments for class (a) structures having a height of 20 feet or less as measured from the lowest point on the original centerline profile to the crest of the emergency spillway will meet the Engineering Standard and Specification for Pond (378).

2. The design of embankments for all structures exceeding the limitations in 1 above either in dimension or hazard shall be based on State Standards and criteria where the product of height times storage is less than 3,000 and on the requirements of SCS Engineering Memorandum-27 when the product exceeds 3,000.

3. Simple structures with island type construction shall have fill sideslopes of 2:1 or flatter and top width of 4 foot minimum that will provide a stable structure for local conditions.

4. Stability of downstream channel shall be determined for all structures except those with pumped outlets. The channel grade below the aprons shall be such that velocities will not cause scour and undermine the structure. Velocity in the channel will be determined using a 10-year-frequency rainfall or bankfull flow if it occurs before the 10-year frequency flow occurs.

   Permissible velocities for general soil types are:

Sandy loam	1.75 feet per sec.
Silt loam	2.00 " " "
Stiff clay, graded loam	3.75 " " "
Shales and hard pan	5.00 " " "

Site Evaluation

Foundation investigations shall be made at each site. Sufficient soil boring will be taken and recorded to determine suitability of site for the proposed structure. Foundation material shall have adequate supporting strength for loads to be imposed on it, resistance to piping and not be subject to uneven settlement. When a significant amount of borrow material will be used as fill, borings of borrow area shall be taken to determine suitability for fill, and if sufficient amount of borrow is available for construction.

Plans and Specifications

Plans and specifications for installation of Grade Stabilization Structures shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

All trees, brush, stumps, stone (6 inches or larger) and other debris shall be removed from the area to be occupied by the structure and earth embankment.

Excavation

Structure excavation shall be to the elevations as shown on the plan or as directed when change conditions are encountered. All vertical or overhanging banks shall be sloped to 1:1 or flatter. Excavation shall be large enough to free movement by workmen.

Concrete

All concrete shall have a compressive strength of not less than 3,000 pound per square inch at 28 days. A mixture of one part cement, two parts of clean well grade fine aggreate (sand) and three parts of clean well graded coarse aggreate (gravel or crushed stone) by weight using not more than six gallons of clean water will normally provide a concrete that will meet the above strength requirement. Coarse aggreate shall not be larger than 1-1/4 inch.

Except for aprons, cutoff walls, and toe walls under drop spillway and cradles or bedding for conduits earth shall not be used as part of the forms.

Reinforcing Steel

All bar reinforcing steel shall be standard deformed bars having a tensile strength of not less than 20,000 pound per square inch. Pipe, smooth iron bars, and scrap iron pieces shall not be used. When reinforced mesh is shown or specified on the plans standard reinforcing, mesh shall be used.

Backfill and Embankments

No backfill or other load shall be placed against or on top of unsupported concrete surfaces before expiration of the minimum period after placing concrete as indicated below unless test shows require strength has been obtained in a lesser period of time.

Walls and vertical faces	10 days
Conduits (inside forms in place)	7 days
Cradle or bedding	2 days

No rolling or hauling equipment shall be permitted to pass over the structure or closer than two (2) feet to any part thereof for a period of 14 days. Backfill shall be hand tamped all around the structure before rolling equipment is allowed to complete compaction of backfill.

Earth embankments shall have a minimum topwidth and be placed in accordance with specifications as given in Practice 378 (ponds).

All earth embankments, borrow areas and other disturbed areas shall be fertilized and seeded in accordance with Standard and Specification 342 Critical Area Planting.

Laying and Bedding Pipe

Unless otherwise specified, pipe shall be installed in accordance with the manufacturer's recommendations. The pipe shall be laid with the outside lap or circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical midheight of the pipe. Field welding of corrugated galvanized iron or steel pipe will not be permitted. Unless otherwise specified, the pipe sections shall be jointed with standard coupling bands. The pipe sections shall be firmly and uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings.

The pipe shall be loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

Cost Sharing

1. Materials, installed and backfilling

   Cost share, when planned and established according to the above specifications, will be 75 percent of the actual cost of the structure not to exceed 75 percent of the estimated cost.

   Unit Price = $1,500.00 per structure
   Maximum Cost Share = $1,125.00 per structure

2. Seeding disturbed areas

   Cost share when planned and carried out according to the above specifications, will be 65 percent of the actual cost not to exceed 65% of the estimated cost. The seeding will be mulched with straw at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

   Unit Price = $150.00 per acre
   Maximum Cost Share = $97.50 per acre

   Practice will be eligible for payment when the structure is installed and the seeding and mulching are completed.

412 GRASSED WATERWAY OR OUTLET (Acres)

Definition

A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose runoff from a field, diversion, terrace, or other structure.

Purpose

To provide for the disposal of excess surface water from terraces, diversions, culverts, or from natural concentrations without damage by erosion or flooding.

Where Applicable

This practice applies to all sites where added capacity or vegetative protection, or both, are required to control erosion resulting from concentrated runoff and where such control can be achieved by these practices alone, or combinations with others as a necessary part of an overall conservation plan to protect the soil and water resources.

The grassed waterway practice is not applicable to watercourses where construction of a waterway would destroy important woody wildlife cover and the present watercourse is capable of hauling the concentrated runoff without serious erosion. Such situations are usually recognizable by a meandering condition, steep side slopes which are stabilized by woody plants or herbaceous vegetation, and the watercourse is without rapidly advancing overfalls.

Design Criteria

Capacity

The minimum capacity shall be that required to confine the peak runoff expected from a storm of 10-year frequency, 24 hour duration obtained by using the procedures in Chapter 2, SCS Engineering Field Manual, except that on slopes of less than 1 percent, out-of-peak flow may be permitted where such flow will not cause erosion. The minimum in such cases shall be the capacity required to carry within the channel, the runoff as determined by using the "B" drainage cover. (0.168 cfs per acre of drainage area).

Velocity

Design velocities shall not exceed those obtained by using the procedures, "n" values, and recommendations in Chapter 7, SCS Engineering Field Manual. Design velocities shall not exceed 5 feet per second.

Width

The bottom width of trapezoidal waterways or outlets shall not exceed 70 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

Depth

The minimum depth of a waterway or outlet receiving water from terraces, diversions, or other tributary channels shall be that depth required to keep the design water surface elevation in the waterway or outlet at, or below, the design water surface elevation in the terrace, diversion, or other tributary channel at their junction when both are flowing at design depth.

Drainage

Tile or other suitable subsurface drainage measures shall be provided for in the design for sites having water table or seepage problems, except where water-tolerant vegetation such as reed canarygrass can be used.

Cross Section

Where farm equipment must cross the waterway during farming operations, side slopes shall not be steeper than 4:1, with 6:1 or flatter recommended. Waterways may be constructed either parabolic or trapezoidal.

Specifications

All trees, brush, stumps, and other objectionable material shall be disposed of so they will not interfere with construction or proper functioning of the waterway or outlet.

The waterway or outlet shall be shaped or constructed to the specified dimensions, free of bank projections or other irregularities.

Where establishment of vegetation is a problem on exposed subsoil, some topsoil should be preserved and replaced.

All earth not needed in construction of the waterway or outlet shall be spread or disposed of so it will not interfere with the function of the waterway or outlet.

Where water flow will interfere with establishment of vegetation, a temporary diversion should be installed above the waterway and by spoil ridges along the sides of the waterway and retained until the seeding is established. After the waterway seeding is established, the temporary diversion is filled, smoothed and seeded.

Fills shall be compacted as needed to prevent unequal settlement, that would cause damage in the completed waterway.

In critical areas such as, sharp breaks in channel grade or where excessive velocities would cause channel scour, paper netting, jute netting or sod should be used.

Seeding

1. Apply lime as needed.

2. Apply 600 lbs. or more of 12-12-12 fertilizer (or its equivalent) per acre as soon as the waterway has been constructed.

3. Prepare a firm seedbed.

4. Seed one of the following grass mixtures:

Tall Fescue	20#/ac.
Redtop	5#/ac.
Tall Fescue	20#/ac.
Perennial Ryegrass	5#/ac.
Reed Canarygrass	15#/ac.
Redtop	5#/ac.
Tall Fescue	30#/ac.
Smooth Bromegrass	20#/ac.
Redtop	5#/ac.

5. Use a mulch of 1-1/2 to 2 tons per acre on critical sites. Anchor the mulch by working it partly into the soil or with paper netting. Jute netting or sod may be used on critical sites instead of mulch.

Other Factors to Consider

Make seedings across the waterway to avoid rows running up and down hill. Operating a cultipacker seeder in an S curve or weaving pattern is an acceptable procedure for seeding.

Cost Sharing

Cost share, when planned and established according to the above specifications, will be 80 percent of the actual cost involved not to exceed 80 percent of the estimated cost.

Unit Price = $.60 per cubic yard of earth moved
Maximum Cost Share = $.48 per cubic yard of earth moved

Seeding of Waterway

Cost share when planned and established according to the above specifications will be 80 percent of the average cost of $75.00 per acre. Cost share will be 80 percent of the average cost of $150.00 per acre when seeded and mulched with 1-1/2 ton of straw per acre

Maximum Cost Share = $60.00 per acre - seed only
Maximum Cost Share = $120.00 per acre - seed and mulch

NOTE: In addition, tile drainage as referred to in the above specification may be cost shared under Practice 606 (Tile Drainage).

Practice is eligible for payment when waterway is completed and seeded.

[illegible] AND TANKS (Number)

Definition

A fabricated structure or one made by constructing a pit, dam or embankment or combination thereof for temporary storage of animal or agricultural wastes, associated runoff and waste water. (Does not include disposal lagoon.)

Scope

This standard establishes the minimum acceptable quality for design and construction of holding ponds and tanks as part of overall waste management systems in predominantly rural or agricultural areas. For holding ponds this standard is applicable to class (a) ponds with fill heights of 20 feet or less.

The following practices may also be applicable to the extent that they are needed to minimize erosion and/or control runoff across or from feedlots, holding areas, etc. Such practices may include but are not limited to critical area planting (342), terraces (600), diversions (362), grassed waterways (412), drainage field ditch (590), grade stabilization structures (410), debris basins (350), drain (606), structures for water control (587), and pond (378).

Purpose

Holding ponds and tanks are constructed to store liquid and solid manure and polluted runoff from feed lots, barn yards and similar areas until it can be safely utilized, evaporated or otherwise disposed of.

Conditions Where Practice Applies

General

This practice applies where there is need for facilities to temporarily store liquid and/or solid manure or other agricultural wastes, reduce sources of air and water pollution, minimize health hazards and improve the environment.

State and Local Laws

All state and local laws, water quality standards, rules and regulations governing the disposal of manure or other agricultural wastes must be strictly adhered to. The owner is responsible for securing any and all

permits or approvals as required. The owner or operator must submit the plans to and secure the approval of the Stream Pollution Control Board for all systems that include holding ponds or tanks.

Other Publications

Recommendations found in the publication for beef, dairy, swine, and poultry "Waste Handling and Disposal Guidelines for Indiana," by the Cooperative Extension Service, Purdue University, should be followed where applicable.

Design Criteria - Holding Ponds and Tanks

Location

Locate holding ponds and tanks as near the source of polluted runoff as practicable giving due consideration to economics of gravity flow and plan of proposed disposal facilities. Locate where prevailing winds will minimize odor problems to neighbors and owner. Holding ponds and tanks should be located no closer than 500 feet from existing residences other than that of the owner or operator, and no closer than 1300 feet from churches, business, recreation, or residential areas. Holding ponds and tanks shall be located so that non-polluted runoff is excluded to the fullest extent possible. This should include the diversion of all unpolluted surface runoff from areas outside the feet lot.

All roof water should be diverted from the holding facilities by the use of roof gutters. An exception to this may be made when this water is needed for mixing water, but a method of diverting the water away from the holding facility must be provided to prevent excess water from entering the facility.

New confined feeding facilities should not be located adjacent to streams, water courses, lakes, ponds, marshes, or drain inlets.

Soil and Foundation

Locate on soils of slow or very slow permeability or soils suitable for sealing to avoid pollution of ground water. Soils with high water tables or soils subject to flooding should be avoided. Contamination of ground water should be prevented by avoiding sand or gravelly soils or shallow soils over fractured or cavernous rock. Soil borings shall be made, and recorded to a minimum depth of two feet below the planned bottom of the holding pond. The log at the boring shall describe the soil in detail and note the ground water elevation if any.

Size

The minimum storage capacity is the volume required to store the 90 day accumulation of animal waste and polluted runoff. Also the Indiana

Stream Pollution Control Board requires that all wash water and other waste water from milk houses and milking parlors be outletted into a holding pond or tank or an approved septic system must be used. In order to provide required storage the pond or tank must be able to hold as a minimum the sum of the following amounts:

1. Runoff from the contributing area:

   Paved - 12 inches
   Earth - 6 inches

2. Animal waste - Use table below or amounts from "Waste Handling and Disposal Guidelines" by the Cooperative Extension Service, Purdue University.

Animal	Cu. Ft./ day/head	Cu. Ft./head/ 90 days
Dairy Cattle	1.3	117
Beef Cattle	1.0	90
Feeder Pigs under 40 lbs.	0.06	5
Hogs	0.28	25
Sow and Litter	0.55	50
Sheep	0.11	10
Chickens	0.003	0.3

3. Fountain leakage and other water wasted by hogs 0 to 0.07 cu. ft./day/head.

4. Milk house wash water-estimated amount.

Disposal Facilities

Provisions for emptying the holding pond or tank without polluting surface waters shall be provided to insure that sufficient capacity is available between emptyings. Determination of emptying time shall be based on the chance of overflow from subsequent storm runoff, and animal wrote accumulation, and capacity of the disposal areas. Excess infiltration such as to pollute ground water shall be avoided.

Facilities for emptying the holding facilities, such as tank wagons or irrigation equipment, will be provided to deliver the wastes to the spreading area. The emptying of the facility will require the use of a pump with adequate capacity against the required pumping head. When irrigation type equipment is used pipe line and irrigation type sprinkler head(s) will be needed. Selection of this equipment should be according to manufactures recommendations recognizing the presence of solids in the liquids and the corrosive nature of the liquids.

Protection

Fencing and warning signs shall be provided as necessary to prevent children and others from using the facilities for purposes other than intended.

Vegetation

Embankments and areas surrounding settling basins and holding ponds shall be protected from erosion by vegetation or other acceptable methods.

Maintenance

All storage facilities shall be inspected periodically. Grass, weeds, and brush shall be controlled.

Design Criteria - Holding Ponds

Earth Embankment

Standards for earth embankments, as required, for holding ponds shall be as specified under Code 378 - Ponds. Preference should be given to 3:1 or flatter slopes for areas which must be mowed.

Inlet and Outlets

The inlet to the holding pond may be of any type designed in accordance with appropriate standards, and must be provided for erosion control of the inlet area. A surface drainage system should drain water away from all feed bunks, barns, sheds and manure storage areas. Lot drainage must be conveyed in open channels or conduits which can be cleaned easily. Avoid long runs of conduits, culverts under roadways or openings under feed bunks which may clog and require hand cleaning. Where conduits must be used to convey manure, provide easy access for rodding and cleaning. All pipes to handle manure must be 8" or larger and be on a slope of 1% or more. The holding pond shall have no mechanical spillways or emergency spillways unless approved by the Indiana Stream Pollution Control Board.

Settling Basin

To minimize frequent cleaning of solids from holding ponds it is desirable, where practical, to install low gradient inlet channels or debris basins to settle out most solids prior to entrance to the holding pond. The inlet channel or debris basin should have adequate capacity to store settled solids for a reasonable period of time based on the method of disposal, facilities available and expected

volume. The debris basin shall have a minimum volume equal to one inch of runoff from the contributing area and have sufficient additional area to provide velocities through the basin less than 1.5 feet per second, using peak flows of three C.F.S. per acre of contributing area. The minimum capacity of the outlet will be three C.F.S. per acre of contributing area.

Design Criteria - Holding Tanks

Materials and Design

Holding tanks shall be watertight structures of reinforced concrete, steel or other durable material giving due consideration to the nature of the wastes. They shall be designed to prevent failure due to internal or external pressures including imposed surface loads and uplift pressure. All openings shall have tight fitting covers or other equally effective protective devices. The landowner shall provide a set of plans showing design and construction details. Such plans shall be signed by a qualified engineer. Standard plans developed by Purdue University or anyother Land Grant College are acceptable.

Size

Tanks shall have sufficient volume to temporarily store accumulated wastes plus any needed dilution water for the maximum period of time that such waste cannot be safely disposed of due to weather or operational restrictions.

Appurtenant Equipment

Special liquid waste handling equipment shall be available to agitate the waste remove it from the tank and carry it to selected areas for spreading. Commercial agitators, pumps and liquid manure tanks are available. Sprinkler irrigation systems, when properly designed and operated to safely dispose of liquid wastes, can be utilized.

Plans and Specifications

Plans and Specifications for Holding Ponds and Tanks shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

Cost Sharing

50% of actual cost not to exceed 50% of the estimated cost.

Unit Price = $5,600.00 per installation
Maximum Cost Share = $2,800.00

Practice is eligible for payment when the holding tanks are completed.

466 LAND SMOOTHING

Definition

Removing irregularities on the land surface by use of special equipment. This ordinarily does not require a complete grid survey. This includes operations ordinarily classed as rough grading. It does not include the "floating" done as a regular maintenance practice on irrigated land or the "planning" done as the final step in a land leveling or land grading job.

Purpose

The purposes of land smoothing include one or more of the following: To improve surface drainage, to provide more effective management of water, to obtain uniform planting depths, to provide for more uniform cultivation, to improve equipment operation efficiency, to improve terrace alignment, and to facilitate contour cultivation.

Conditions Where Practice Applies

This practice applies on lands where depressions, mounds, old terraces, turn rows, and other surface irregularities interfere with the application of needed soil and water conservation and management practice where more precise leveling or grading is not practical.

It is limited primarily to cropland areas having adequate soil depths.

Specifications

1. The ground surface must be plowed 6-8" deep and thoroughly disked prior to smoothing operations. The surface must be free of vegetation and trash to facilitate smoothing operations.

2. The smoothed surface shall slope (either uniformly or at varying grades) into natural or constructed outlets. Grade must not be less than 0.05 per cent.

3. Field drains must be provided as needed on all smoothed fields to collect and dispose of surface runoff. These field drains or collection ditches shall not be spaced more than 600 feet apart.

4. The depth of smoothing shall be controlled to prevent exposing harmful amounts of subsoil.

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5. At least one pass of a land plane or leveler must be made in each of three directions, consisting of one pass along the diagonals, with the last pass generally in the direction of cultivation.

6. Spot checks to assure drainage toward the outlets shall be made.

Working Tools and References

Indiana Drainage Guide
Land Smoothing for Better Surface Drainage JS-27
Parallel Ditch System JS-5
Cross Slope Ditch Systems JS-4
Engineering Field Manual for Conservation Practices

Cost-Sharing

Cost-share, when planned and established according to the above specifications, will be 70 percent of the actual cost involved not to exceed 70 percent of the estimated cost.

Unit Price = $90.00 per acre
Maximum Cost-Share = $63.00 per acre

NOTE: In addition, field drains as required in the above specification may be cost-shared as a separate item under practice 590 Surface Drains.

Practice is eligible for payment when all the leveling work is completed.

472 LIVESTOCK EXCLUSION (Acres)

Definition

Excluding livestock from an area where grazing is not wanted.

Purpose

To protect, maintain, or improve the quantity and quality of plant and animal resources; to maintain or improve cover for protection of soil; improve watersheds hydrologic condition; and to increase natural beauty. To protect, in addition to woodlands, the wildlife and recreation areas where grazing would be harmful or create a safety hazard.

Where Applicable

Where desired forest reproduction, soil hydrologic value, wildlife value, existing vegetation (including trees) or other things, such as asthetic values or recreation are prevented or damaged by livestock

Where a change of the land-use of adjacent fields is brought about, so that livestock do not have access to the area being protected.

Will not apply for units of land where no livestock is present or planned for in future.

Specifications

All classes of livestock will be excluded on a long-time basis by fencing or other means.

Cost-Sharing

Cost-sharing for fencing is limited to permanent fences (excluding boundary and road fences) needed to protect the area from grazing.

Cost-sharing, when established according to the attached specifications, 382 Fencing, will be 80% of the actual cost involved not to exceed 80% of the estimated cost.

Unit Price = $8.00 per rod
Maximum Cost-Share = $6.40 per rod

Practice is eligible for payment when the fencing is completed.

382 FENCING (Feet)

Definition

Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock. (Does not include electric or other temporary fences).

Purpose

To exclude livestock from areas that should be protected from grazing and/or protect new seedings and plantings from grazing.

Where Applicable

On any area where livestock exclusion is needed.

Materials

Barbed wire, woven wire and wire netting fencing shall conform to the requirements of Federal Specifications RR-F-221 for the specified types and styles of fencing. Wire shall have Class 2 zinc coating unless otherwise specified. Woven wire fence will be type 1047-6-11. Barbed wire will be 12-1/2 gage. Woven wire will include two barbed wires on top. Barbed wire fence will have a minimum of five strands of barbed wire.

Wood posts shall be of black locust, red cedar, osage orange (Bois d'Arc), redwood, pressure treated pine or other wood of equal life or strength. At least half the diameter or diagonal dimension of red cedar or redwood posts shall be in heartwood. The posts shall be sound, new, free from decay, with all limbs trimmed substantially flush with the body. They shall be substantially straight throughout their length.

Wood braces shall be of material equal to or better than construction grade Douglas Fir. They shall be pressure treated.

Steel fence posts and braces shall conform to the requirements of Federal Specification RR-F-221. Posts with punched tabs for fastening the wires shall not be used.

Panel gates shall be the specified types, sizes, and quality and shall include the necessary fittings. The fittings shall consist of not less than two hinges and two latches or galvanized chains for fastening. All fittings shall be equivalent to the gate manufacturer's standard.

Wire gates shall be the type shown on the drawings, constructed in accordance with these specifications at the location and to the dimensions shown on the drawings. The materials shall conform to the kinds, grades, and sizes specified for new fence, and shall include the necessary fittings and stays.

Setting Posts

Concrete or wood posts shall be set in holes and backfilled with earth except where otherwise specified. Steel posts shall be driven unless otherwise specified.

Post holes shall be at least 6 inches larger than the diameter or side dimensions of the posts.

Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the post hole up to the ground surface.

Corner Assembly

Unless otherwise specified, corner assemblies shall be installed at all points where the fence alignment changes 15 degrees or more.

End Panels

End panels shall be built at gates and fence ends.

Pull Post Assembly

Pull post assemblies shall be installed at the following locations:

a. In straight fence sections, at intervals of no more than 660 feet.

b. At any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 degrees (except as provided in Section 9 of this specification).

c. At the beginning and end of each curve.

Attaching Fencing to Posts

The fencing shall be stretched and attached to posts as follows:

a. The fencing shall be placed on the side of the post opposite the area being protected, except on curves.

b. The fencing shall be placed on the outside of the curves.

c. The fencing shall be fastened to each end post, corner post and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps.

d. The fencing shall be fastened to wooden line posts by means of staples. Woven wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Staples shall not be driven so tightly as to bind the wire against the post.

e. The fencing shall be fastened to steel line posts with either two turns of 14 gage galvanized steel or iron wire or the post manufacturer's special wire clips.

f. Wire shall be spliced by means of Western Union splice having not less than 8 wraps of each end about the other. All wraps shall be tightly wound and closely spaced.

Crossings at Depressions and Watercourses

Where fencing is installed across the small depressions or watercourses, either of the following methods of installation shall be used.

a. If the fence wire is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored by means of extra embedment or by special anchors.

b. If the wire fence is installed with the top wire straight and parallel to the ground surface on either side of the depression, extra length posts shall be used to allow normal post embedment. Unless otherwise specified, excess space between the bottom of the fence and the ground shall be closed with extra strands of barbed wire.

614 LIVESTOCK WATERING FACILITY (Number)

Definition

A trough or tank with needed devices for water control and waste water disposal installed to provide drinking water for livestock.

Scope

This standard covers all trough or tank installation to provide livestock watering facilities supplied from a spring, reservoir, well or other sources.

Purpose

To provide watering facilities at selected locations which will bring about the desired protection of vegetation cover through proper distribution of grazing or better grassland management.

Conditions Where Practice Applies

This practice applies where there is a need for new or improved watering places to permit the desired level of grassland management and reduce health hazards to livestock.

Design Criteria Trough or Tank

The trough or tank shall have adequate capacity to meet the water requirements of the livestock it is to serve. This will include the storage volume necessary to carry over between periods of replenishment. The site shall be well drained and areas adjacent to the trough or tank that will be trampled by livestock shall be graveled, paved or otherwise treated to provide firm footing. Automatic water level control and overflow facilities shall be provided. Overflow shall be piped to a desirable point of release. The quality and durability of all materials shall be in keeping with the planned useful life of the installation.

Design Criteria Livestock Watering Ramp

The livestock watering ramp will be located on a flowing stream or a pond with water of satisfactory quality and quantity for the number of livestock

to be watered during the season of use. The minimum width will be 10 feet and the maximum slope will be 4:1. The watering ramp shall be fenced in such a manner to keep livestock from the stream or pond proper. All construction will be done in a manner that will reduce erosion to a minimum during and after construction. The ramp and all areas that livestock have access to will be graveled or paved or otherwise treated to provide firm footing. All other disturbed areas will be seeded.

Specifications

Specifications shall be in keeping with the preceding standard, shall describe the requirements for proper installation of the practice to achieve its intended purpose, and shall include consideration of the following items:

The foundation area shall be cleared of all material not suitable for the subgrade.

The foundation area in the immediately surrounding area shall be smoothed and graded to permit free drainage of surface water.

All materials, placement, anchoring, proportioning, and protection shall be as shown on the plans.

All backfill for underground pipes shall be compacted to the degree required to prevent caving subsequent to construction.

All construction shall be performed in a workmanlike manner and the job shall have a neat appearance when finished.

Cost-Sharing

Cost-share when planned and installed according to the above specifications will be as follows:

1. Trough or Tank

   Cost-share will be 70 percent of the actual cost not to exceed 70 percent of the estimated cost.

2. Watering Ramp

   Cost-share will be 70 percent of the actual material and installation costs not to exceed 70 percent of the estimated cost.

Unit Price = $300.00 per installation
Maximum Cost Share = $210.00 per installation

Practice will be eligible for payment when the watering facility is completed.

478 MINIMUM TILLAGE

Definition

Limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage.

Purpose

To improve soil structure, reduce soil compaction, erosion and production costs and make possible timely field operations for planting and harvesting a crop.

Where Applicable

On all cropland.

Specifications

The land involved must be protected by winter cover, or crop residue, or other permitted management methods from fall harvest through the winter to the time of authorized tillage in the spring.

Eligible tillage operations are:

1. Zero-tillage, slot planting, and no-till (includes planting into sod).
2. Strip tillage
3. Till-plant
4. Chisel tillage
5. Combinations of no-plow systems

Cost share payment will not be made on acreage where a moldboard plow is used.

All tillage operations must be performed as nearly as practicable on the contour or parallel to terraces where feasible and needed.

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Chemicals used in performing this practice must be Federally and locally registered and must be applied strictly in accordance with authorized registered uses, directions on the label, and other Federal or State policies and requirements.

Methods

1. Zero Tillage, Slot Planting and No-Till (include planting into sod)

Crop residue is left on the surface from the prior crop. It may be shredded in the fall, winter, or spring prior to planting. In some instances, it may be left unshredded.

The seedbed is prepared by breaking the soil with a coulter, single chisel, or similiar tool. Seedbed preparation and planting are done in one operation.

A protective cover of crop residue is left on the soil surface between the crop rows during the growing season.

The quantity of residue needed on the soil surface is determined by use of the Universal Soil Loss Equation ("C" factor for 90% covered).

There is no more than one cultivation. (No cultivation should be used unless weeds are a problem).

2. Strip Tillage

Crop residue is left on the soil surface from the prior crop. It may be shredded in fall, winter, or spring prior to planting. Is some instances, it may be left unshredded.

A seedbed is prepared by a rotary tool or similar type equipment that mixes the soil and residue in an area not to exceed 1/3 the width between the crop rows. The remainder of the area is left untilled. Seedbed preparation and planting are accomplished in one operation.

A protective cover of crop residue is left on the surface of the untilled area during the growing season.

The quality of residue needed on the soil surface is determined by use of the Universal Soil Loss Equation ("C" factor for 66% covered).

There is no more than one cultivation. (No cultivation should be used unless weeds are a problem.

Contouring is necessary on slopes that normally require contouring with conventional tillage.

3. Till Plant

Crop residue is left on the soil surface from the prior crop. It may be shredded in the fall, winter, or spring prior to planting. In some instanced, it may be left unshredded.

The seedbed is prepared by scalping the area of the crop row, pushing soil and residue to the row middles. Seedbed preparation and planting are completed in one operation.

A protective cover of crop residue is mixed with and left on the surface soil layer between the crop rows during the growing season. Soil protection is provided by the combined effects of a rough, cloddy surface and crop residue.

The quantity of residue needed on the soil surface is determined by use of the Universal Soil Loss Equation ("C" factor for 66% covered).

There is no more than one cultivation.

Contouring is necessary on slopes that normally require contouring with conventional tillage.

4. Chisel Tillage

Crop residue is left on the soil surface from the prior crop. It may be shredded in the fall, winter, or spring prior to planting. In some instances it may be left unshredded.

A seedbed is prepared by chiseling for, primary tillage without inversion of the soil. Chiseling may be done in the fall, winter, or spring prior to planting. Secondary tillage may be one strip only with disc or sweeps. Seedbed preparation and planting may or may not be accomplished in the same secondary tillage operation.

A protective cover of crop residue is left on the soil surface during the growing season. Soil protection is provided by the combined effects of a rough, cloddy surface and crop residue.

The quantity of residue needed on the soil surface is determined by use of the Universal Soil Loss Equation. (Use the "C" factor for 66% covered, even though some residue will be found on the entire surface area).

There is no more than one cultivation.

Contouring is necessary on slopes that normally require contouring with conventional tillage.

5. Any combination of no-plow systems which leaves 2/3 of the soil surface rough and with residue cover until July 1, and is planted on contour if required conventionally. Soil loss is within the limit required by the Universal Soil Loss Equation.

Guidelines for use of Conservation Tillage Systems

1. Zero tillage and rotary strip tillage (where all crop residues are left on the soil surface and no primary tillage is done) are not recommended to be used on less than well drained soils. In the northern 1/3 of Indiana these practices are better suited to coarse and moderately coarse textured soils that are somewhat excessively to excessively drained than to medium textured, well drained soils.

2. The till-plant system is not recommended to be used on undulating soils where contouring is not feasible. Till planting works best in a performed ridge.

3. A disk should not be used in the fall as a primary tillage tool or bean ground. If bean ground is disked, it should only be done in the spring.

4. The no-plow tillage systems are not recommended to be used where Johnsongrass is a problem.

5. Where cultivation is done, rolling or disk hiller type cultivators will be needed for zero tillage, strip tillage, and till planting, and may be needed for chisel tillage if stocks are not chopped.

6. Assistance of the Cooperative Extension Service should be secured in the use of herbicides and insecticides and for fertilizer recommendations.

Cost-Sharing

Cost-share, when planned and applied according to the above specifications, will be 80% of the average cost of $6.50 per acre.

Unit Price = $6.50 per acre
Maximum Cost-Share = $5.20 per acre

Practice will be eligible for payment on August 1, (after the crop is too big to be cultivated).

510 PASTURE AND HAYLAND MANAGEMENT (Acres)

Definition

Proper treatment and use of pastureland or hayland.

Purpose

1. Prolong the life of desirable species.
2. Maintain or improve the quantity and quality of forages.
3. Provide soil protection and reduce water loss.
4. Provide for the needs and desires of the landowner for forage production and economic return.

Where Applicable

On all pastureland and hayland.

Specifications

Pastureland

1. Grazing at the proper time.

    a. Delay grazing in the spring until the soil is firm and the forage attains proper growth stage. Spring grazing may be started:

    When Bluegrass is 4"-5", tall and soil is firm.

    When orchardgrass or tall fescue is 8 inches tall.

    When smooth bromegrass or timothy is 8 inches tall and before jointing or between early head and full head.

    When birdsfoot trefoil is 6-8 inches high.

    When alfalfa is in full bud.

Grazing will be rotated when grasses are grazed down to 3 inches or higher.

Under extensive grazing systems (continuous grazing) the pasture grasses will not be grazed closer than an average of 3 inches.

2. Grazing with the proper amount of livestock.

   a. The number of livestock grazed is in keeping with the expected yield.

   b. Refer to Agronomy Technical Notes 2 and 3 for guidelines on grazing with the proper amount of livestock.

3. Treating with Needed Soil Amendments to Maintain Stand and Obtain Desired Production.

   a. Liming and Fertilizing - apply according to results of soil test.

   b. Mow, as needed, to control weeds and brush and to provide more uniform regrowth and grazing.

Hayland

1. Cutting at Proper Growth Stage - refer to Agronomy Technical Note 3 for guidelines.

2. Treating with Needed Soil Amendments to Maintain Stand and Obtain Desired Production.

   a. Liming and fertilizing -apply according to results of soil test.

Cost-Sharing

Cost-share, when planned and carried out according to the above specifications, will be 65% of the average cost of $18.00 per acre.

Unit Price = $18.00 per acre
Maximum Cost-Share = $11.70 per acre

Practice is eligible for payment after any needed lime and fertilizer is applied and grazing height has been inspected.

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512 PASTURE AND HAYLAND PLANTING (Acres)

Definition

Establishing and re-establishing long-term stands of adapted species of perennial, biennial or reseeding forage plants. (Includes Pasture and Hayland Renovation, does not include Grassed Waterway or Outlet on Cropland).

Purpose

To serve as ground cover for soil protection, produce high quality forage and to adjust land use.

Where Applicable

On existing pasture and hayland or on land that is converted from other uses.

Specifications

1. On sloping land with a serious erosion potential use mulch seeding methods and perform all fitting and seeding operations on the contour. Where necessary to eliminate present cover competition when preparing a mulch seedbed, start seedbed preparation in late summer for spring seedings and in early spring for fall seedings.

2. On fairly level land conventional seedbed preparation can be used.

3. The seedbed should be firm, containing enough fine soil particles for uniform shallow coverage of the seed.

Liming, Fertilizing and Seeding

1. Apply lime and fertilizer according to needs determined by soil test.

2. For spring seeding, seed as early as possible. Make fall seedings during August. In some instances it may be advisable to use one bushel of oats as a companion crop to help control erosion and weed growth in spring seedings.

3. Cover the seed 1/4 to 1/2 inch deep by hand seeding with press wheels, use of a cultipacker seeder or by cultipacking before and after seeding.

4. Use seeding mixtures, rates and dates for different species by soil groups as shown in the following table or the attached sheet of seeding mixtures adapted to this work unit.

Management the seeding year

1. Mow or graze the companion crop when 10 inches in height to reduce competition with the new seeding.

2. If necessary to control weeds, mow or graze to a height of 6-8 inches. Do not graze during period 8 weeks prior to first hard frost nor during the dormant period in fall of the seeding year.

Directions for selecting mixtures from the seed mixture chart:

In any vertical column use all amounts which are not in parenthesis. When parenthesized figures are listed, add only one parenthesized amount.

Mixtures 8 and 11 are well adapted for horse pastures.

Mixture 4 is adapted to special situations where spring seeding is done in anticipation of current year harvest. Applies only to fairly non-erosive sites with a very high management level.

Mixture 14 is adapted for hog pasture to be used on level land only.

Grass alone would generally be used in special situations: i.e, tall fescue for winter pasture, any grass where a large amount of nitrogen is a by-product, as in a poultry operation.

When use of a mixture is in question, check plant adaptation on the chart following this chart.

SEED MIXTURES FOR PASTURE AND HAY CROPS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Alfalfa	10			18										10
Alsike Clover			2						3-4					
Birdsfoot Trefoil								5-6						
Ladino Clover									1/4		1/4			1
Korean Lespedeza										8		15		
Red Clover		8	6							6				
Sericea Lespedeza													20	
White Clover										1	(1-2)			
Ky. Bluegrass								(2-4)			4			
Orchardgrass	(4-6)	(4-6)	(4-6)				8-10		(4-6)		4	(4-6)		
Reed Canarygrass									8					
Smooth Bromegrass	(6-8)				10-12									
Tall Fescue	(6-8)	(6-8)				15-20			(6-8)	10-15		10-15	8-10	
Timothy	(2-4)	(2-4)	(2-4)					(2-4)						

Instructions for use of the chart below:

The figure 1 indicates the plant is well adapted, 2 indicates the plant can be used but is less well adapted and a blank space indicates that it is not adapted or not suggested for use.

Birdsfoot trefoil is well adapted.

Smooth bromegrass is well adapted.

	Pasture		Hay	Site Adaption			Suitable pH
	Rotation Grazing	Continuous Grazing		Droughty	Well Drained	Poorly Drained	
Alfalfa	1		1	1	1		6.2-7.5
Alsike Clover	1	2	1	2	1	1	5.5-7.5
Birdsfoot Trefoil	1	2	1	2	1	2	5.5-7.0
Ladino Clover	1	1	2		1	1	5.6-7.0
Korean Lespedeza	1	1	2	1	1		4.5-6.5
Red Clover	1	2	1	2	1	2	6.0-7.5
Sericea Lespedeza	1	2	2	1	1		4.5-6.5
White Clover	1	1			1	1	5.6-7.0
Ky. Bluegrass	1	1		2	1	2	5.5-7.0
Orchardgrass	1	1	1	2	1	2	5.5-7.5
Reed Canarygrass	1	2	2	1	1	1	5.0-7.5
Smooth Bromegrass	1	2	1	1	1		5.5-8.0
Tall Fescue	1	1	2	2	1	2	5.0-8.0
Timothy	1	2	1		1	2	4.5-8.0

Cost-Sharing

Cost-share, when planned and carried out in accordance with the above specifications, will be 70% of the average cost of $70.00 per acre.

Results of laboratory soil test and evidence that lime and fertilizer applications were made in accordance with the test results will be documented.

Unit Price = $70.00 per acre
Maximum Cost-Share = $49.00 per acre

Practice is eligible for payment when the practice seeding is completed.

378 POND (Number)

Definition

A water impoundment made by constructing a dam or embankment. An excavated pond will be acceptable only when the primary use is for livestock water.

Purpose

Ponds are constructed to provide water for livestock, flood water detension and sediment control.

Pond Size Minimums

All ponds will have a minimum of 1/2 acre surface area. The dam or embankment will have minimum height of four feet above the present ground level. The watershed will be a minimum of 5 acres. All ponds with a watershed between five and ten acres will be constructed with a 6" trickle tube. A minimum of one foot of storage, between flowline of trickle tube and flowline of emergency spillway, will be required. Ponds with over 10 acres of watershed will be designed according to Engineering Memo IN-7.

Scope

This standard establishes the minimum acceptable quality for the design and construction of class (a) ponds located in predominantly rural or agricultural areas when:

1. Failure of the structure would not result in loss of life; in damage to homes, commercial or industrial buildings, main highways, or railroads, or in interruption of the use of service of public utilities.

2. The product of the storage times the effective height of the dam does not exceed 3,000 where the storage is defined as the original volume (acre-foot) in the reservoir at the elevation of the crest of the emergency spillway and the effective height of the dam is defined as the difference in elevation (feet) between the emergency spillway crest and the lowest point in the cross section taken along the centerlines of the dam.

3. The vertical distance between the lowest point along the centerline of the dam and the crest of the emergency spillway does not exceed 20 feet.

4. The storage in the reservoir at the elevation of the crest of the emergency spillway does not exceed 100 acre-feet: or

5. Drainage area does not exceed 30 acres.

6. The ratio of pond area to drainage area falls within the following guidelines:

   a. For slowly permeable soils having slopes greater than seven (7) percent (such as Fairmount, St. Clair and other Hydrologic Group C&D Soils) not less than 1:4 or more than 1:20.

   b. For moderately permeable soils (such as Cincinnati, Miami, Alford, Meta and other Hydrologic Group B&C Soils) and slowly permeable soils with less than seven (7) percent slopes not less than 1:6 or more than 1:20.

   c. For permeable soils, (such as Bloomfield, Oaktown and other Hydrologic Group A Soils) not less than 1:10 or more than 1:30.

   Structures exceeding the scope of this standard shall be designed in accordance with latest design criteria and approved by an engineer classified to approve the size of the job. Construction plans for structure exceeding the scope of items 1 through 4 above shall be given to the landowner for submission to the Indiana Natural Resources Commission for its approval before construction begins.

Conditions Where Practice Applies

Site Conditions

Site conditions shall be such that the peak rate of runoff that can be expected to occur once in 25 years can be safely passed through (1) a natural or constructed emergency spillway, or (2) a combination of a principal structural spillway and an emergency spillway, except that a storm of 10-year-frequency may be used for drainage areas less than 20 acres in size.

Drainage Area

The drainage area above the pond must be protected against erosion to the extent that expected normal sedimentation will not shorten the planned effective life of the structure. It is desirable to have

at least fifty (50) percent cover. When any part of the drainage area is in cropland it shall be protected by adequate conservation practices to hold soil losses within the allowable soil loss limits.

Ponds shall be protected from contaminations from barnyards, septic tanks or other sources when such contaminations would be incompatible with the planned use.

Depth

The topography and soils of the site shall permit storage of water at a depth and volume which will insure a dependable supply, considering beneficial use, sedimentation, season of use, and evaporation and seepage losses.

Minimum depth shall be 8 feet over at least 25 percent of pond or pit area at permanent water level, or where underlying rock prevents excavation to that depth, a minimum of 6 feet over at least 50 percent of the area.

When the primary purpose is for fish production, at least 75 percent of the shoreline shall be steepened to a slope of 3:1 or steeper to a depth of 3 feet below permanent pool level. Excess excavated material may be used to construct earth fishing piers into the pond.

Foundation

The area on which a dam is to be placed shall consist of material that has sufficient bearing strength to support the dam without excessive consolidation. The foundation must consist of or be underlain by relatively impervious material which will prevent excess passage of water.

Reservoir Area

Where surface runoff is the primary source of water for a pond, the soils shall be impervious enough to prevent excessive seepage losses, or shall be of a type that sealing is practicable.

Ponds shall have a minimum surface area of 0.5 acres. This size pond may be stocked with two or more species of fish.

Soil and Foundation Investigation

Investigation shall be made of the fill site, pool area, and borrow areas to determine if the requirements listed above under Depth, Foundation, and Reservoir Areas can be met.

In addition to the above, investigation shall be in sufficient detail to determine that adequate borrow is available, that the emergency spillway can be excavated as planned, and that the mechanical spillway foundation is suitable.

Vegetation

On Embankment Ponds, a protective cover of vegetation shall be established on all exposed surfaces of the embankment, spillway, borrow, and spoil areas. Provide a strip of permanent vegetation extending 50 feet from the waterline on the sides of the pond and 100 feet on the upstream and where physically possible on Embankment Ponds. On Excavated Ponds, provide an adjacent area equal to two times the areas of the water surface. Develop these areas with plantings compatible to wildlife including both woody and herbaceous plants suggested in specification "Critical Area Planting" (342), "Recreation Area Planting" (562), and "Wildlife Upland Habitat Management" (645). Mowing should be restricted to 50% of the grassy area, thereby providing varied types of food and cover throughout the year.

Fencing

General

Ponds shall be adequately fenced when necessary to prevent grazing damage. Fencing will be done according to specifications 382 (Fencing).

Excavated Ponds

The fence shall be at least 10 feet from the edges of the pit except the approach slope for livestock watering pits. When stock are watered directly from the pit, the fence shall extend across the ramp in to the pond.

Embankment Ponds

When used for livestock water, the entire fill, spillways and pond area shall be fenced to exclude livestock. The fence shall not be closer to water than 50 feet on each side and 100 feet on the upstream side. Watering facilities for stock shall be provided outside the fenced area.

Clearing

Part of the pool area may be left uncleared for fish and wildlife habitat.

EMBANKMENT PONDS

Design Criteria

General

Design criteria for ponds depend on such factors as drainage area, height of dam, depth of water to be impounded, surface area of pond and hazard to life and property in case of failure.

Design Hydrology

The minimum frequency design shall be selected from the standards outlined in Engineering Memorandum - INDIANA-7. Peak discharges and runoff volumes shall be determined by methods outlined in the SCS Engineering Field Manual.

Foundation Cutoff

A cutoff of relatively impervious material shall be provided under the dam. The cutoff shall extend along the centerline of the dam and it abutments as required and be deep enough to extend into a relatively impervious layer. Where the foundation consists of relatively impervious material, a minimum cutoff trench of 2 foot depth shall be excavated. Where the possibility of drain tile exists the cutoff should be deep enough to intercept them.

The cutoff shall have a bottom width of not less than 8 feet and side slopes of 1:1 or flatter. Wider bottom widths to accomodate the equipment used for excavation, backfill, and compaction operations may be used. The most impervious material available shall be used to backfill the cutoff trench and tc construct the core of dam.

Top Width

The minimum top width of the dam shall be 10 feet.

Side Slopes

The combined upstream and downstream side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical with the front slope never steeper than 2-1/2:1, and the back slope never steeper than 2:1.

Freeboard

The minimum elevation of the top of the settled embankment shall be 1 foot above the water surface in the resevoir with the emergency spillway flowing at design depth.

Allowance for Settlement

The design height of the dam shall be increased by the amount necessary to insure that the design top elevation will be maintained after settlement has taken place. This increase shall not be less than percent.

Pipe Conduits

A pipe conduit, with needed appurtenance, shall be placed under or through the dam except where the drainage area is [illegible] and not fed by springs or seeps or where flow is [illegible] through a rock spillway.

Size

The capacity of the pipe conduit shall be adequate to discharge duration, continuous, or frequent flows without flow through the emergency spillway. The minimum diameter of the pipe shall be 8 inches or 6 inches if corrugated metal.

When the pipe conduit diameter is 10 inches or greater the pipe discharge may be considered in calculating the peak outflow rate through the emergency spillway.

Crest Elevation of Inlet

The crest elevation of the inlet or riser shall be at least 1 foot below the crest elevation of the earth spillway. When the pipe conduit is designed as a principal spillway, the crest elevation of the inlet or riser shall be such that full flow will be generated in the barrel before there is discharge through the earth spillway with a minimum difference in elevation of one foot.

The invert of hooded inlets shall be not less than 1.8 times the diameter of the conduit below the crest of the emergency or earth spillway with a minimum difference of 1 foot.

The riser or inlet will be protected from ice and floating debris by the semi-circular berm or not less than 4 feet from the riser. The berm is necessary when a hooded inlet is used but the invert of the hooded inlet shall project one (1) foot beyond the fill slope.

Pipe Materials

The following materials are acceptable: Cast-iron, wrought iron, steel, corrugated metal, asbestos-cement, concrete, and rubber gasket vitrified clay. All pipe joints shall be made watertight by the use of watertight couplings or gaskets or by welding or caulking. Asbestos-cement, concrete, and vitrified clay pipe shall be laid in a concrete bedding. All pipe shall be capable of withstanding the external loading.

Riser or Inlets

Risers or inlets for pipe conduits may be reinforced concrete, concrete blocks, concrete culvert pipe, vitrifiedclay pipe, steel pipe or corrugated metal pipe. All risers will be equiped with anti-vertex baffles. Hooded inlets may also be used. When round risers are used, an 18-inch diameter riser shall be used for 12-inch diameter and smaller conduit, and 21-inch diameter riser used for 15-inch diameter conduit.

Risers shall have a height adequate to insure full pipe flow in the barrel. Concrete culvert pipe risers shall have the bell or groove end of the pipe up. All pipe risers shall have an extra foot of length below the invert of the conduit and be filled with concrete to invert of conduit. When concrete or vitrified clay pipe is used for the conduit, concrete shall also be placed around the outside of the riser enclosing the first joint of the conduit.

Outlets

The outlet for pipe conduits may be a propped outlet or a reinforced concrete outlet. The outlet section shall be a minimum of 20 feet long. The prop should be 8 feet from outlet end. An exception may be made when the pipe is not more than one (1) foot above the grade of the original channel bottom, and is supported by a compacted berm extending to within four (4) feet of the end of the pipe.

A concrete outlet will not be used unless it has been determined that the grade below the outlet is stable and will not scour.

Anti-seep Collars

Anti-seep collars shall be installed around all pipe conduits within the normal saturation zone.

The anti-seep collars and their connections to the pipe shall be watertight. The maximum spacing shall be approximately 14 times the minimum projection of the collar, measured perpendicular to the pipe. The first anti-seep collar to be placed approximately between the centerline of the fill and the upstream edge of the top of the fill but not more than 20 feet, downstream from the pipe inlet.

Drain Pipe

A drain pipe with a suitable valve shall be provided where the primary purpose is for fish management, recreation, or to control aquatic waterweeds. The pipe conduit may be used as a drain when so located as to accomplish this function. The drain should be large enough to draw the pond down 8 feet in 2 weeks, (approximately 16 GPM or 0.04 c.f.s. per AF of storage).

For pond management information see Technical Guide Standard Specification 399 Fishpond Management.

Trash Guards

Where necessary to prevent clogging of the conduit, a trash guard shall be installed at the inlet or riser. Trash guards shall be of such a type as not to reduce flow to the inlet.

Water Supply Systems

One of the following water supply systems may be installed where used for livestock watering.

1. An outlet filter or sump with an outlet pipe, cutoff valves and tank or trough.

   Outlet pipe shall have a minimum diameter of 1-1/4 inch and connected to a tank outside the fenced pond and fill area. When pipe is laid under or through the embankment, the pipe will be laid in a trench, and have at least 2 anti-seep collars of at least 15 inches in diameter. The trench walls shall be sloped, and backfill carefully hand tamped.

2. A metal or plastic siphon with valve (using same size or pipe as given in 1 above) laid over the fill and permanently connected to a tank or trough outside the fenced area.

3. A pump system, with adequate capacity to meet livestock needs. The system shall include an inlet filter and be connected to a tank or trough outside the fenced area.

Emergency Spillways

Capacity

The design standards will be selected from SCS Engineering Memorandum EMEMA-7. Emergency spillways shall have a trapezoidal cross section and be located in undisturbed or compacted earth. The side slopes, shall be stable for the material in which the spillway is constructed, but not less than 2:1 except when cut in rock.

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Component Parts

Constructed spillways shall have an inlet channel and an exit channel.

Upstream from the control section the inlet channel shall be level for the distance needed to protect and maintain the crest elevation of the spillway. The inlet channel may be curved to fit existing topography.

The grade of the exit channel if a constructed spillway shall fall within the range established by discharge requirements and permissible velocities. It shall terminate at a point well removed from any part of the embankment where the design flow may be discharged without damage to the earth embankment.

EXCAVATED PONDS

Design Criteria

General

This type of reservoir is generally constructed in flat land areas where an Embankment Pond is not feasible. The water supply is obtained from underground seepage, high water table, springs, tile lines or surface runoff. An adequate water supply which will maintain desired water level in pond must be assured. When used for livestock water, the water level shall not be more than four feet below surface of ground.

Depth

An exception to the depth requirements shown on page 3 may be made if the water supply is derived from seeps or spring flows. In this case the pit must have a depth of at least 4 feet over 25 percent of the pit area.

Side Slopes

Side slopes of excavated ponds shall be such that they will be stable and shall not be steeper than the minimum side slopes shown on table following. Where livestock will water directly from the pond, a watering ramp with a minimum width of 10 feet shall be provided. The ramp shall extend to the anticipated low water elevation at a uniform slope no steeper than 4:1.

TYPE OF SOIL	MINIMUM SIDE SLOPE
Peat and Muck	1:1
Fine Sand	2-1/2:1
Coarse Sand and Gravel	2:1
Silt Loam	2:1
Sandy Loam	2:1
Clay Loam	1-1/2:1

Inlet Protection

Where surface water enters the pond in a natural or excavated channel, the side slope of the pond shall be protected against erosion.

Placement of Excavated Material

The material excavated from the pond shall be placed in one of the following ways so that its weight will not endanger the stability of the pond side slopes and there it will not be washed back into the pond by rainfall:

1. Uniformly spread to a height not exceeding 3 feet with the top graded to a continuous slope away from the pond.
2. Uniformly placed or shaped reasonably well with side slopes not exceeding a natural angle of repose for the excavated material behind a berm width equal to the depth of the pond but not less than 10 feet.
3. Used for low embankment and leveling.
4. Hauled away.

Plans and Specifications

Plans and specifications for installation of ponds shall be in keeping with this standard and shall describe the requirements for application for the practice to achieve its intended purpose. See page S-378-1 for items to be considered in development of specifications.

Cost Sharing

1. Earth moving, clearing, and materials and installation of mechanical spillways, stock watering systems and fences.

   Cost share, when planned and constructed according to the above specifications will be 60 percent of the actual costs of the pond not to exceed 60 percent of the specified maximum cost of $3,000.00 per pond.

   When the pond is constructed after September 30 - a dormant seeding or a spring seeding is required. All disturbed areas will be mulched with straw at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

   For a dormant seeding, seed will be applied sometime between December 10 - and February 28. Lime, fertilizer and mulch will be applied after construction and before seeding.

   For a spring seeding the area will be reworked by discing and the seed applied. Additional mulch will be applied at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

Cost share rate = $1,800 per pond

2. Seeding disturbed areas.

   Cost share, when planned and carried out according to the above specifications, will be 50 percent of the actual cost not to exceed 50 percent of the specified maximum cost of $150.00 per acre. All seedings will be mulched with 1-1/2 ton of straw per acre or 2 bales per 1000 sq. ft.

Cost share rate = $75.00 per acre

NOTE: Cost share will not be allowed for single purpose recreation or wildlife excavated ponds.

Practice will be eligible for cost share when the pond and seeding is completed.

Construction Note

The drop inlet tube shall be installed as the dam is being constructed. As the dam is being constructed the fill shall not exceed the planned top elevation of the conduit before the pipe is installed. The fill will then be compacted around the tube and antiseep collar(s) at least 2 feet, either by hand or mechanical compaction and then proceed with final fill. No compaction or backfilling shall be done with frozen material.

Cost Sharing

1. Earth moving, clearing, and materials and installation of mechanical spillways, stock watering systems and fences.

   Cost share, when planned and constructed according to the above specifications will be 60 percent of the actual costs of the pond not to exceed 60 percent of the estimated cost.

Unit Price = $3,000.00 per pond
Maximum Cost Share = $1,800.00 per pond

2. Seeding disturbed areas

   When the pond is constructed after September 30 - a dormant seeding or a spring seeding is required. All disturbed areas will be mulched with straw at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

   For a dormant seeding, seed will be applied sometime between December 10, and February 28. Lime, fertilizer and mulch will be applied after construction and before seeding.

   For a spring seeding the area will be reworked by discing and the seed applied. Additional mulch will be applied at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

   All seedings will be mulched with 1-1/2 ton of straw per acre or 2 bales per 1000 sq. ft.

   Cost share, when planned and carried out according to the above specifications, will be 50 percent of the actual cost not to exceed 50 percent of the estimated cost.

Unit Price = $150.00 per acre
Maximum Cost Share = $75.00 per acre

NOTE: Cost share will not be allowed for single purpose recreation or wildlife excavated ponds.

Practice will be eligible for cost share when the pond and

689 LAND PROTECTED DURING DEVELOPMENT (Number & Acres)

Definition

Treatment based on a plan to control erosion and sediment during development for residential, commercial - industrial, community services, transportation, routes or utility uses.

Purpose

To reduce erosion and sedimentation during the period of land development. This practice includes timely installation of single or a combination of temporary or permanent vegetative or mechanical conservation measures.

Where Applicable

Land protection measures include: Diversions, interceptor berms, swale grading, sediment or debris basins, blind surface inlets (french drains), critical area protection, mulching, etc.

Specifications

An individual plan will be prepared indicating the seasonal period when development land is to receive cut-fill operations, vegetative stripping, swale grading operations, etc. All land thus disturbed or otherwise exposed to weather will be treated (or seasonal modifications to this plan made) according to the attached guide.

This practice may involve a combination of temporary and permanent practices. For individual practice specifications refer to: Critical Area Planting (342); Diversions (362); Grade Stabilization Structures (410); Grass Waterway (412); Land Smoothing (466); Recreation Area Improvement (562); Sediment Control Basin (350); Streambank Protection (580); Surface Drains (590); Terraces (604); Tile Drains (606); and Woodland Improvement (666).

Cost Sharing

Individual conservation practices as listed above under "specifications" will be cost shared as a unit under this practice.

Cost share, when needed measures are planned and carried out in the proper season, and in accordance with the standards and specifications for the

individual practices, will be 75% of the actual cost not to exceed 75% of the estimated cost.

Unit Price = $100.00 per acre
Maximum Cost Share = $75.00 per acre

Practice is eligible for payment when all necessary work has been completed.

562 RECREATION AREA IMPROVEMENT (Acres)

Definition

Establishing grasses, legumes, vines, shrubs, trees, or other plants or selectively reducing stand density and trimming woody plants to improve an area for recreation.

Purpose

To increase the attractiveness and usefullness of recreation areas and protect the soil and plant resources.

Planting of vegetative materials for wind protection, shade screens, ornamentation, and resistance to heavy human traffic, including secondary benefits of wildlife food and cover.

Thinning and pruning of natural or planted shrubs and trees to provide space for recreational activities, allow air and sun penetration, remove hazardous materials and yet keep aesthetically valuable trees or shrubs.

Where Applicable

On any area planned for recreational or recreation-wildlife use.

Specifications

I. Establishing Plants:

A. Grasses and Legumes - applicable only in open and partially shaded areas.

Seedbed Preparation

1. Shallow plow or use heavy disk, field cultivator or similiar type tool.

2. Where trees are present, care should be taken to not cut too deep and cause tree root injury.

3. Prepare a firm seedbed, containing enough fine soil particles for uniform shallow coverage of the seed.

Liming, Fertilizing and Seeding

1. Apply lime and ferilizer according to needs determined by a soil test. Without a soil test, use a minimum of 500 pounds 12-12-12 fertilizer, or equivalent, per acre.

2. Cover seed about 1/4 to 1/2 inch deep in a compact seedbed. Shallow depth (1/4 inch) is better for bluegrass.

3. For spring seedings, seed as early as a seedbed can be prepared (March, April). Make fall seedings during August, or to September 10.

4. On areas where vegetation is difficult to establish or subject to erosion, straw mulch at 1-1/2 tons per acre (70 pounds per 1,000 square feet) may be necessary to insure satisfactory stand establishment and early soil protection.

TABLE I - Recreation Area Seeding Guide

Primary Use of Area	Species	Seeding Rate		Suitable pH	* Site Suitability		
		Lbs/ Acre	Lbs/ 1000 S.F.		Droughty	Well Drained	Wet
Parking Lots (Unsurfaced)	Tall Fescue	40	1	5.4-7.5	2	1	2
Land Sports (Athletic fields, playgrounds, hard-use areas)	Tall Fescue	40	1	5.4-7.5	2	1	2
	Tall Fescue Ky. Bluegrass	25 15	5/8 3/8	5.8-7.5		1	2
Recreation areas surrounding heavy use areas Golf Courses (fairways, roughs)	Tall Fescue	25	5/8	5.4-7.5	2	1	2
Picnic, camp & scenic areas	Ky. Bluegrass	30-40	3/4-1	5.8-7.5		1	2
Open Sunlight	Tall Fescue Ky. Bluegrass	15-20 15-20	3/8-1/2 3/8-1/2	5.8-7.5		1	2
Partial Shade	Tall Fescue Creeping Red Fescue	15-20 15-20	3/8-1/2 3/8-1/2	5.5-7.5	2	1	
	Ky. Bluegrass Creeping Red Fescue	15-20 15-20	3/8-1/2 3/8-1/2	5.8-7.5	2	1	
Lawns and Lawn-type areas	Bluegrass Blends		2	5.8-7.5	2	1	2
Open Sunlight	Bluegrass Blends 90% Redtop 10%		2	5.8-7.5	2	1	2
Partial Shade	Creeping Red Fescue Ky. Bluegrass or Bluegrass Blends		2	5.8-7.5	2	1	
Temporary lawn cover (to be destroyed and re-seeded later)	Ryegrass 90% Redtop 10%		2-3	5.5-7.5	2	1	2

* 1/ Preferred; 2/ Will tolerate

I. A. (Cont'd.)

Maintenance

1. To maintain vigorous cover, make an annual application of fertilizer high in nitrogen.

2. Re-seed or sod areas of high intensity use to maintain adequate cover as the need arises.

3. Frequency and height of mowing will depend upon use of the area.

B. Trees, Shrubs, and Vines to be used for:

1. Windbreaks on north and/or west sides of area.

2. Erosion control plantings.

3. Screens to hide unsightly views and serve as sound barriers.

4. Barriers to seperate various uses, and help direct foot traffic.

5. Provide additional shade and ornamental species.

6. Introduction of plants to attract song birds and other forms of wildlife.

Planting Materials

1. All "bare rooted" plants should be planted in spring, as early as the condition of the soil will allow, March, April and before May 15 unless stock has been held back in cold storage. Balled-burlaped stock may also be planted in fall during October, November and early December.

2. Woody planting materials may be seedlings, transplants, rooted cuttings, or balled-burlaped stock.

Adapted Species for recreation areas are listed in Table II as follows:

TABLE II - Recreation Area Tree and Shrub Planting Guide a/

Purpose, Use, and Aesthetic Value	Species	Spacing	Growth Rate b/ Height	Tolerance Sun - Shade		Drainage Requirements c/ Poorly Drained	Well Drained	Droughty
SHADE AND ORNAMENTAL	**Trees:**							
Evergreen								
	White Pine	65'	M 90'	x	x		1	2
	Red Pine	65'	M 75'	x			2	1
	Norway Spruce	4/ac.	S 80'	x	x	1	2	
	Blue Spruce	2/ac.	VS 60'	x	x		1	2
Deciduous								
red and yellow	Sugar Maple	65'	S 70'		x		1	2
scarlet	Pin Oak	65'	M 75'	x		1	2	2
red and brown	Red Oak	65'	M 65'	x			1	2
rustic	Bur Oak	65'	S 75'	x		1	2	
red	White Oak	65'	M 90'	x			1	2
brown	Hickory	65'	S 75'		x		1	2
red	Black Gum	65'	M 55'	x	x		1	2
yellow	Tulip Poplar	65'	M 100'	x			1	2
yellow	Thornless Honey-locust	65'	F 75'	x		2	1	2
attractive bark	Sycamore	65'	F 90'	x		1	2	
sheds needles	Bald Cypress	65'	M 90'	x		1	2	
yellow	Ginko (male only)	65	F 60'	x			1	2
white bark	White Birch	1 & 2'in clump of 3-4	M 40'	x		2	1	
ORNAMENTAL & WILDLIFE	Shrubs and trees:							
Evergreen d/								
	Yew	varied	VS 4-10'		x		1	2
	Hemlock	varied	S 4-10'	x	x	2	1	
	Juniper	varied	F 4-6'	x			1	2
	Arborvitae	varied	M 5-15'	x		1	2	
Flowering								
	Dogwood	varied	S 20-25'		x		1	2
	Redbud	varied	S 15-20'	x			1	
	Flowering Crab	varied	M 20-30'	x			1	
Clump color red	Sumac: Smooth or Staghorn	6-8'	F 10-30'	x			1	2

TABLE II (Cont'd.)

Purpose, Use, and Aesthetic Value	Species	Spacing	Growth Rate b/ Height	Tolerance Sun-Shade		Drainage Requirements c/ Poorly Drained	Well Drained	Droughty
Fruiting								
	Crabapple	Varied	S 20-30'	x			1	
	Blackhaw	Varied	S 15-20'	x	x		1	2
	Cranberry, highbush	Varied	F 6-10'	x	x		1	2
	Autumn Olive	Varied	M 8-14'	x			1	2
	Honeysuckle, bush	Varied	M 6-16'	x	x		1	
VEGETATIVE BARRIER AND WILDLIFE	Multiflora Rose	1'	M 6-10'	x		2	1	
SCREENS AND BORDERS Evergreen d/								
	White Pine	6-8'	M Top and	x	x		1	2
	Virginia Pine	6-8'	F shear	x			1	2
	Red Pine	6-8'	M at	x			2	1
	Hemlock	2-3'	S desired	x	x	2	1	
	Yew	2-3'	VS height.		x		1	2
	Autumn Olive	4'	M 8-14'	x			1	2
	Cranberry, highbush	3-4'	F 6-10'	x	x		1	2
	Lespedeza, bicolor var. Natob	1½-2	F 4-8'	x	x	2	1	2
	Multiflora Rose	1'	M 6-10'	x	x	2	1	
	privet, sp.	2'	F 6-10'	x	x			
	Honeysuckle, bush	3-4'	M 6-16'	x				
	Hawthorne, Washington	4-6'	M 6-16'	x			1	2
GROUND COVER Semi evergreen (broad leaf)								
	Euonymus Wintercreeper	2-3'	F 2' hx 3' w		x	2	1	
	Ground Myrtle	2'	F ½'		x	2	1	
	Jap. Honeysuckle	3-6'	F 1' (climbing)	x	x		1	2

a/ On sites with severe erosion hazards see practice #342 Critical Area Planting.

b/ Growth rate symbols: F = fast; M = medium; S = slow; VS = very slow.

c/ Drainage 1/ = preferred; 2/ = will tolerate.

d/ The evergreen species should be topped and shaped as required when planted for "Ornamentals" or "Screens and Borders."

II. Thinning and Pruning in Natural or Planted Stands of Wood Material for Recreation Area Improvement.

A. Thinning

1. On intensive use areas, leave about 10 to 15 larger (10" + DBH) sound trees per acre for sheds.

2. Favor for retention the deep rooted species such as red oak, bur oak, white oak, sugar maples, hickory, black gum, tulip poplar, etc.

3. Retain some flowering and wildlife food plants such as dogwood, redbed, serviceberry, pawpaw, persimmon, etc.

4. Occasionally there will be portions of a recreational area, where a part of woody cover should be left unthinned, such as odd corners not needed for intensive use, where natural cover makes a screen, and on steep escarpments or erosive areas.

5. Removal of woody materials should be accomplished by cutting flush with the ground line. This will leave topsoil in place, and not injure roots of trees or shrubs being retained.

B. Pruning

1. Intensive use area trees should have lower limbs removed to a minimum height of 12 feet, so as to provide space for recreation activities and save on cost of maintenance operations.

2. Pruning cuts should be made as close to the tree trunk or main stem as possible. All large limbs should be cut in a method that will not strip or tear bark on remaining part of tree. (See job sheet "Taking Care of Your Trees.")

3. Where recreation pressure is not heavy and growing space is ample, a few specimen trees should be left unpruned to add natural beauty. (e.i. Pin Oak, Spruces, White Pine, Red Cedar, etc.).

III. Maintenance

A. To prevent sprouting, chemically treat stumps immediately after cutting.

B. Poisonous plants like poison ivy should be chemically sprayed and eliminated from recreation areas.

C. Maintain open areas by periodic mowing and/or spraying to prevent the encroachment of undesirable vegetation.

Caution: Chemicals used must be Federally and locally registered and must be applied strictly in accordance with authorized registered uses, directions on the label, and other Federal or State policies and requirements.

Cost-Sharing

Cost-share, when planned and carried out according to the above specifications, will be 50% of actual costs involved not to exceed 50% of the estimated cost.

Unit Price = $200.00 per acre
Maximum Cost-Share = $100.00 per acre

Practice is eligible for payment when seeding and other required work is completed.

350 SEDIMENT CONTROL BASIN (Number)

Definition

A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Purpose

To preserve the capacity of reservoirs, ditches, canals, diversions, waterways, and streams; to prevent undesirable deposition on bottomlands and developed areas; to trap sediment originating from construction sites; and to reduce or abate pollution by providing basins for depositions, and storage of silt, sand, gravel, stone, agricultural wastes, and other debris.

Conditions Where Practice Applies

This practice applies where physical condition or land ownership preclude the treatment of the sediment source by the installation of erosion control measures to keep soil and other material in place, or a basin offers the most practical solution to the problem.

Design Criteria

Sediment control basins shall be designed by a qualified engineer. A geologist and/or soil scientist shall be consulted to estimate rate or production and volume of sediment to be expected. The applicable portions of standards and specifications 378 Ponds, shall be followed except as indicated below.

The basin shall have an estimated life or not less tha 15 years based on estimated rate of sediment, etc., that would be produced.

The design of dams, spillways, and drainage facilities shall be in accordance with the standards for Ponds, Grade Stabilization Structures or Engineering Memorandum No. 27, as appropriate for the class and kind of structure being considered.

Safety measures to protect the public from the hazards of soft sediment and floodwater are to be established as conditions dictate.

Plans and Specifications

Plans and specifications for installation of basin shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

The applicable portions of standards and specifications 378 Pond shall be followed.

Cost-Sharing

1. Earth moving; clearing; and materials and installation of mechanical spillways, and fences.

   Cost-share, when planned and constructed according to the above specifications will be 70 percent of the actual cost of the structure not to exceed 70 percent of the estimated cost.

   Unit Price = $6,000.00 per structure
   Maximum cost-share rate = $4,200.00 per structure

2. Seeding disturbed areas

   Cost-share, when planned and carried out according to the above specifications will be 70 percent of the actual cost not to exceed 70% of the estimated cost.

   Unit Price = $150.00 per acre
   Maximum Cost-Share Rate = $105.00 per acre

   Seeding and mulching requirements for Sediment Control Basins built after September 30, are the same as those for practice 378 Pond.

   The practice is eligible for payment when the basin is constructed and the seeding is completed.

584 STREAM CHANNEL STABILIZATION (Feet)

Definition

Stabilizing the channel of a stream with suitable structures.

Scope

This standard covers the structural work done to control aggradation or degradation in a stream channel. It does not include work done to prevent bank cutting or meander.

Conditions Where Practice Applies

This practice applies to stream channels undergoing damaging aggradation or degradation that cannot be feasibly controlled by clearing or snagging, by the establishment of vegetative protection, or by the installation of upstream water control facilities, and which require the application of structural measures.

Design Criteria

It is recognized that channels may aggrade or degrade during a given storm or over short periods of time. A channel is considered stable if, over long periods of time, the channel bottom remains essentially at the same elevation.

In the design of a channel for stability, consideration shall be given to the following points:

1. The character of the materials comprising the channel bottom.

2. The quantity and character of the sediments entering the reach of channel under consideration. This shall be analyzed on a basis of both present conditions and projected changes caused by changes in land use or land treatment and upstream improvements or structural measures.

3. Streamflow peaks, velocities, and volumes at various flow frequencies.

4. The effects of changes in velocity of the stream produced by the structural measures.

Structures installed to stabilize stream channels shall be designed and installed to meet Soil Conservation Service standards for the particular structure and type of construction involved.

Plans and Specifications

Plans and specifications for installation of stream channel stabilization shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose. Specifications for each streambank stabilization measure will be prepared to meet on-site conditons by the responsible engineer.

Disturbed areas shall be seeded and maintained in good vegetation. Vegetation will be established according to specification 342, Critical Area Planting.

Cost-Sharing

Strear channels considered under "1/ Strear Channel Stabilization," Table A-10, Black Creek Study, require fencing as a major input for maintaining a stabilized channel and controlling erosion and sedimentation.

1. Fencing to Exclude Livestock

   Where protection from livestock is necessary, fencing is planned and installed will be cost-shared in accordance with practice 472, Livestock Exclusion.

2. Structural Practices

   a. Rip-rap stream channels considered under "2/ Stream Channel Stabilization," Table A-10, Black Creek Study, require extensive installation of rip-rap.

Cost-share, when planned and carried out according to the above specifications, will be 80% of the actual costs involved not to exceed 80% of the estimated cost.

Unit Price = $10.00 per ton - machine placed
Maximum Cost-Share Rate = $8.00 per ton

   b. Stabilization Structure

Cost-share, when planned and installed according to the above specifications, will be 80% of the actual cost not to exceed 80% of the estimated cost.

Unit Price = $5,000.00 per structure
Maximum Cost-Share Rate = $4,000.00 per structure installed

3. Establishing Protective Vegetation on Disturbed Areas

Cost share for establishing protective vegetation on disturbed areas will be made in accordance with that provided for practice 342, Critical Area Planting.

Practice will be eligible for payment when all work is completed.

580 STREAMBANK PROTECTION (Feet)

Definition

Stabilizing and protecting banks of streams or excavated channels against scour and erosion by vegetative or structural means.

Scope

This standard covers the structural means used to stabilize and protect the banks of natural streams and excavated channels.

Purpose

Streambank protection is established to stabilize or protect streambanks for one or more of the following purposes:

1. To prevent the loss of land or damage to utilities, roads, buildings, or other facilities adjacent to the channel.
2. To maintain the capacity of the channel.
3. To control channel meander which would adversely affect downstream facilities.
4. To reduce sediment loads causing downstream damages and pollution or to improve the stream for recreational use or as a habitat for fish and wildlife.

Conditions Where Practice Applies

This practice applies to natural or excavated channels where the streambanks are subject to erosion from the action of water, ice, or debris or to damage from livestock or vehicular traffic.

Design Criteria

Since each reach of channel is unique, measures for streambank protection must be installed according to a plan and adapted to the specific site. Designs shall be developed in accordance with the following principles:

1. Protective measures to be applied shall be compatible with improvements planned or being carried out by others.

2. The grade must be controlled, either by natural or artificial means, before any permanent type of bank protection can be considered feasible unless the protection can be safely and economically constructed to a depth well below the anticipated lowest depth of bottom scour.

3. Streambank protection shall be started at a stabilized or controlled point and ended at a stablized or controlled point on the stream.

4. Needed channel clearing to remove stumps, fallen trees, debris, and bars which force the streamflow into the streambank shall be an initial element of the work.

5. Changes in channel alignment shall be made only after an evaluation of the effect on the land use, interdependent water disposal systems, hydraulic characteristics, and existing structures.

6. Structural measures must be effective for the design flow and be able to withstand greater floods without serious damage.

7. Vegetative protection shall be considered on the upper portions of eroding banks, and especially on those areas which are subject to infrequent inundation.

Streambank Protection Measures

The following is a partial list of elements which may be involved in a plan for streambank protection.

Obstruction Removal - The removal of fallen trees, stumps, debris, minor ledge outcroppings, and sand and gravel bars that may cause local current turbulence and deflection.

Vegetation - Establishing protective vegetation on streambanks by seeding, fertilizing, and mulching to control erosion and sedimentation.

Banksloping - The reduction of the slope of streambanks to provide a suitable condition for vegetative protection or for the installation of structural bank protection.

Rip-Rap - Placed or dumped heavy stone, properly underlaid with a filter blanket when necessary, to provide armor protection for streambanks.

Fish and Wildlife

Special attention will be given to maintaining or improving habitat for fish and wildlife.

Legal Requirements

All work planned and constructed must comply with applicable state laws.

Plans and Specifications

Plans and specifications for installation of streambank protection shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

Specifications for each planned streambank protection measure will be prepared to meet on-site condition by the responsible engineer.

Streambanks and the disturbed areas shall be seeded and maintained in good vegetation. Vegetation will be established according to specification 342, Critical Area Planting.

Cost-Sharing

Cost-share, when planned and carried out according to the above specifications, will be 70% of the actual cost involved not to exceed 70% of the estimated cost.

Unit Price = $2.50 per lineal foot
Maximum Cost-Share Rate = $1.75 per lineal foot

Note: Cost-sharing involving major structure measures, including extensive installation of rip-rap, will be made under practice 584, Stream Channel Stabilization.

Practice will be eligible for payment when all work is completed.

585 STRIPCROPPING, CONTOUR (Acres)

Definition

Growing crops in a systematic arrangement of strips or bands on the contour to reduce water erosion. The crops are arranged so that a strip of grass or close-growing crop is alternated with a strip of clean-tilled crop or fallow; or a strip of grass is alternated with a close-growing crop.

Purpose

To reduce soil and water losses.

Where Applicable

On sloping cropland where the topography is sufficiently uniform to permit practical tillage and harvesting operations, and where the cropping system needs the support of the strip arrangement to effectively reduce soil and water losses.

Specifications

1. The Universal Soil Loss Equation will be used to determine adequacy of erosion control with contour stripcropping.

2. Strip boundaries will be laid out on the contour with a maximum allowable deviation of 3 percent for distance of 100 feet or less. Where diversions are used to break the slope, they will be used as guidelines.

3. Guidelines for soils with moderate or slower permeability shall be established on a slight grade of 0.5 to 1 percent toward drainageways.

4. Planting of crops and tillage operations shall usually be parallel to strip boundaries with short rows in the middle of the tilled strips. Where this is not acceptable, planting may be started at the top of the tilled strip, leaving any short rows at the bottom of the strip.

5. By careful attention to field layout and starting at the critical part of the slope, it is often possible to maintain uniform width strips (parallel sides).

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6. Strips shall be established according to the following widths, within slope percent groups. Make needed adjustments in strip widths to fit equipment where strips have parallel sides.

Percent Slope	Strip in Width in Feet
2-6	100-88
7-12	88-74
13-18	74-60

(A 20 percent deviation in width may be allowed to adjust for a difference in slope on some fields.)

7. Natural and constructed waterways are to be maintained in sod.

Cost-Sharing

Cost-share, when planned and applied according to the above specifications, will be 80% of the average cost of $5.00 per acre.

Unit Price = $5.00 per acre
Maximum Cost-Share Rate = $4.00 per acre

Practice will be eligible for payment when contour strips have been layed out and the first years crops have been planted.

590 SURFACE DRAINS (Feet)

Definition

A graded ditch for collecting excess water within a field. This does not include Drainage Main or Lateral, or Grassed Waterway or Outlet.

Purpose

Surface drains are installed to:

1. Drain surface depressions
2. Collect or intercept excess surface water such as sheet flow from natural and graded land surface or channel flow from furrows for removal to an outlet.
3. Collect or intercept excess subsurface water for removal to an outlet.

Conditions Where Practice Applies

Applicable sites are flat or nearly flat lands that:

1. Have soils of low permeability or shallowness over barriers, such as rock or clay, which hold or prevent ready percolation of water to a deep stratum.
2. Have surface depressions or barriers which trap rainfall.
3. Have insufficient land slope for ready movement of runoff across the surface.
4. Receive excess runoff or seepage from uplands.
5. Require removal of excess irrigation water.
6. Require control of the groundwater table.
7. Have adequate outlets available for disposal of drainage water by gravity flow or pumping.

Design Criteria

Surface drains shall be planned as integral parts of a drainage system for the field served and shall collect, intercept, and remove water to an outlet with continuity and without ponding.

The SCS Engineering Field Manual for Conservation Practices shall be used as guide in the planning and design.

Investigations

An adequate investigation shall be made of all sites. Soils to be drained shall be suitable for agricultural use.

Location

Ditches shall be established, insofar as topography and property boundaries permit, in straight or nearly straight courses. Random alignment may be used to follow depressions and isolated wet areas of irregular or undulating topography. Excessive cuts, and the creation of small irregular fields shall be avoided.

On extensive areas of uniform topography, collection or interception ditches shall be installed as required for effective drainage.

Design

The size, depth, side slopes, and cross section area shall:

1. Be adequate to provide the required drainage for the site and the crop to be grown.

    a. The minimum design capacity of the ditch will accomodate the runoff computed by using the "C" curve for open ditch design in flat areas for field crops. A minimum design accommodating the runoff using the "B" curve will be used for areas on which truck crops are to be grown. A minimum depth of 9 inches and a minimum cross sectional area of 5 square feet for single ditches and 5 square feet for each ditch of a double ditch or (w) ditch will be used.

    b. In a Cross Slope Ditch System, which is planned and designed for the purpose of providing erosion control and surface drainage, the depth and cross section of

the channels will be sufficiently large to carry the peak rate of runoff produced, by a 10-inch frequency rain. The minimum depth will be 6 inches of trapezoidal sections with a 6 feet bottom width and 8:1 side slopes. For a "V" section the minimum depth will be 9 inches with 10:1 side slopes.

2. Permit free entry of water from adjacent land surfaces without causing excessive erosion.

3. Provide effective disposal or reuse of excess irrigation water (where applicable).

4. Conduct flow without excessive erosion. The maximum velocity will be in accordance with those shown on page 14-26 of the SCS Engineering Field Manual for Conservation Practices. A roughness coefficient of "n" = 0.04 will be used in computing velocities.

5. Provide stable side slopes based on soil characteristics.

6. Where crossings with farm equipment a side slope of 8:1 or flatter will be used. A side slope of 2:1 and preferrably 4:1 or flatter may be used where farm operations are parallel to the ditch.

7. Permit construction and maintenance with available equipment.

8. Tile or other suitable subsurface drainage measures shall be provided for on the design for sites having high watertable or seepage problems.

Plans and Specifications

Plans and specifications for construction of Drainage Field Ditches shall be in keeping with this standard and shall describe the requirements for proper installation of the practice to achieve its intended purpose.

Construction

Areas to be excavated and areas to be occupied by spoil shall be cleared of trees, brush, stones, or other debris.

Ditches shall be constructed to a continuous bottom grade toward the outlet. Finished sections shall be uniform and smooth.

Spoil shall be placed or graded in such a manner that with necessary inlets provided, surface water may move freely into the ditch.

Maintenance

Field ditches will be maintained to permit ther to function properly. Field outlets and collection ditches should be cleaned and reopened periodically as required to permit them to function properly. Small deposits of silt will greatly reduce capacities and cause partial or compelte failure of the syster. After each heavy rain the ditches should be inspected and silt deposits or other obstructions removed.

Working Tools and References

Job Sheet #41
Indiana Farm Drainage Guide
SCS Engineering Field Manual for Conservation Practices

Cost-Sharing

Cost-share, when planned and constructed according to the above specifications will be 70 percent of the actual costs of the surface drains not to exceed 70 percent of the estimated cost.

Unit Price = $.50 per lineal foot
Maximum Cost-Share Rate = $.35 per lineal foot

Note: In addition, tile drains as required in the above specifications may be cost-shared as a separate item under practice 606 Tile Drains.

Practice is eligible for payment when the surface drains are completed and the tile are installed, if needed.

600 TERRACES, GRADIENT (Feet)

Definition

An earth embankment or ridge and channel constructed across the slope at suitable spacing and with an acceptable grade.

This standard does not apply to Diversions.

Purpose

Gradient terraces are constructed to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a non-erosive velocity.

Conditions Where Practice Applies

Gradient terraces normally are limited to cropland having a water erosion problem. They shall not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. The topography must be such farmable terraces can be constructed. Gradient terraces may be used only where suitable outlets are or will be made available.

Design Criteria

Spacing 1/ (Graded)

VERTICAL INTERVAL = 0.7s + 2* (s = predominant slope of land above length of terrace.)

FIELD SLOPE - %	1	2	3	4	5	6	7	8	9	10	11*	12*
Vertical Interval	2.7	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4
Horizontal Interval	270	170	134	120	110	103	98	95	93	90	88	86
Feet Per Acre	161	257	325	363	397	424	445	459	474	485	496	507
Acres Per 1000 Feet	6.21	3.89	3.07	2.67	2.52	2.36	2.52	2.18	2.11	2.06	2.02	1.97

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* On slopes steeper than 10% a horizontal interval of 80 feet may be used.

1/ Terrace spacing may be adjusted by applying the Universal Equation for predicting soil loss. The maximum horizontal spacing shall not exceed the slope length for the allowable soil loss determined by using contour cultivation, the most intensive use possible for the land and the expected level of management. The most intensive use possible will be considered continuous row crops unless thoroughly justified.

Vertical spacings determined by either of the above charts may be increased as much as 10 percent of 0.5 foot to provide better alinement or location, to miss obstacles in the field, to adjust for farm machinery, or to reach a satisfactory outlet.

The drainage area above the top terraces shall not exceed the area that would be drained by a terrace or equal length with normal spacing.

Alinement

Terraces in a system shall be made as nearly parallel as practicable. Land smoothing, a moderate amount of cutting and filling along the terrace line, use of multiple outlets, variations in grades, and other methods shall be used as needed to improve alinement.

Capacity

The terrace shall have enough capacity to handle the peak runoff expected from a 10-year-frequency storm without overtopping.

Cross Section

The terrace cross section shall be proportioned to fit the land slope, the crops grown, and the farm machinery used. The ridge height shall include a reasonable settlement factor. The ridge shall have a minimum top width of 3 feet at the design height. The minimum cross-section area of the terrace channel shall be 8 square feet for land slopes of 5 percent or less, 7 square feet for slopes from 5 to 8 percent, and 6 square feet for slopes steeper than 8 percent.

Terraces must have a minimum channel cross section of 8 square feet for terraces up to 500 feet in length, 10 square feet for terraces from 500 to 1000 feet in length, 12 square feet for terraces over 1000 feet in length, and with an overall grade of 0.4 percent. For short distances, terrace grade may vary from 0.2 percent to 0.6 percent to improve alinement. The base must be broad enough to be maintained and farmed on the contour with equipment common to the area. For storage type terraces, grades may be varied to improve alinement. Steeper grades may be permitted near outlets because stored water will reduce the water surface grade.

Spacing of terrace and effective ridge height (measured from top of settled ridge to bottom of channel) shall conform to the table below.

GRADED TERRACE CHANNEL DIMENSIONS
Trapesoidal Cross Section

Field slope (percent)	Needed Terrace Ridge Height in Feet					May vary + or - 10 Percent horizontal interval in feet
Length in Feet	200	400	600	800	1000	
1	0.8	0.9	1.0	1.2	1.2	260
2	0.8	0.9	1.0	1.2	1.2	160
3	0.7	0.9	1.0	1.1	1.2	127
4	0.7	0.9	1.0	1.1	1.1	110
5	0.7	0.9	1.0	1.1	1.1	100
6	0.7	0.8	0.9	1.0	1.0	93
7	0.7	0.8	0.9	1.0	1.0	89
8	0.7	0.8	0.9	1.0	1.0	85
9	0.7	0.8	0.9	1.0	1.0	82
10	0.6	0.8	0.9	1.0	1.0	80

Figures are settled ridge height and are based on a channel with a 6 foot bottom on a 0.4 percent grade. The same height should be used for a 0.6 percent grade. The height should be increased 0.1 foot for a grade of 0.2 percent. A top width of at least 3 feet should be provided.

CROSS SECTIONAL AREA OF TERRACE CHANNELS

Length of Terrace	Cross-Sectional Area
Feet	Square Feet
500	8
500-1000	10
Over 1000	12

Channel Grade

Channel grades may be either uniform or variable from 0.2 foot per 100' to a minimum grade of 0.6 foot per 100 feet of length. For short distances, terrace grades may be increased to improve alinement. The channel velocity shall not exceed that in chart below.

Type of Vegetation	Feet Per Second
Bare Channel:	
Sand and Silts	1.5
Other	2.0
Poor	3.0
	4.0
Good	5.0

Outlet

All gradient terraces must have an adequate outlet. Such an outlet may be a natural grassed waterway, a vegetated area, or underground conduit. In all cases, the outlet must convey runoff from the terrace or terrace system to a point where the outflow will not cause damage. Terrace outlets shall be installed before terrace construction, if needed to insure vegetative cover in the outlet channel or settlement of fill around underground conduit.

The design elevation of the water surface in the terrace shall not be lower than the design elevation of the water surface in the outlet, at their junction, when both are operating at design flow.

Specifications

Specifications will be in keeping with the preceding standard and will include consideration of the following items:

All dead furrows, ditches, or gullies to be crossed shall be filled before construction begins or as part of construction. All old terraces, fence rows, and other obstructions that will interfere with the successful operation of the system shall be removed.

The minimum constructed cross section shall meet the design dimensions.

The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement. The opening at the outlet end of the terraces shall have a cross section equal to that specified for the terrace channel.

The finished channel shall contain no depressional areas which would cease ponding of water damaging to crops.

All tillage operations shall be parallel to the terraces.

Storage type terraces with underground conduits shall be designed in accordance with design procedures in the SCS Engineering Field Manual for Conservation Practices.

Consideration shall be given in terrace and outlet layout to machinery operation needs and field terraces.

Cost-Sharing

1. Underground outlet and inlet system

   Cost-share, when planned and constructed according to the above specifications will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

   Unit Price = $150.00 per system
   Maximum Cost-Share Rate = $120.00 per system

2. Terrace construction

   Cost-share, when planned and carried out according to the above specifications, will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

   Unit Price = $.25 per lineal foot
   Maximum Cost-Share Rate = $.20 per lineal foot

   Practice will be eligible for payment when terraces are completed.

604 TERRACE, PARALLEL (Feet)

Definition

An earth embankment or a ridge and channel constructed across the slope at a suitable spacing and with an acceptable grade.

Purpose

Parallel terraces are constructed to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a nonerosive velocity. To reduce point rows and permit easier planting, cultivation and harvesting of crops.

Where Applicable

Parallel terraces normally are limited to cropland having a water erosion problem. They shall not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. The topography must be such that farmable terraces can be constructed. Parallel terraces may be used only where suitable outlets are or will be made available.

Design Criteria

Spacing 1/ (Graded)

VERTICAL INTERVAL = 0.7s + 2* (s = predominant slope of land above length of terrace).

FIELD SLOPE - %	1	2	3	4	5	6	7	8	9	10	11*	12*
Vertical Inlet	2.7	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4
Horizontal Interval	270	170	134	120	110	103	98	95	92	90	88	86
Feet Per Acre	161	257	325	363	397	424	445	459	474	485	496	507
Acres Per 1000 Feet	6.21	3.89	3.07	2.76	2.52	2.36	2.25	2.18	2.11	2.06	2.02	1.97

*On slopes steeper than 10% a horizontal interval of 80 feet may be used.

1/ Terrace spacing may be adjusted by applying the Universal Equation for predicting soil loss. The maximum horizontal spacing shall not exceed the slope length for the allowable soil loss determined by using contour cultivation, the most intensive use possible for the land and the expected level of management. The most intensive use possible will be considered continuous row crops unless thoroughly justified.

Vertical spacings determined by either of the above charts may be increased as much as 10 percent or 0.5 foot to provide better alinement or location, to miss obstacles in the field, to adjust for farm machinery, or to reach a satisfactory outlet.

The drainage area above the top terrace shall not exceed the area that would be drained by a terrace of equal length with normal spacing.

Alinement

Terraces in a system shall be constructed, insofar as is possible, parallel to each other. Varying channel grade and depth of cuts in various sections of a terrace and in adjoining terraces will be utilized to improve alinement. Land smoothing and use of multiple outlets or other methods should be used to improve alinement.

Capacity

The terrace shall have enough capacity to handle the peak runoff expected from a 10-year frequency storm without overtopping.

Cross Section

The terrace cross section shall be proportioned to fit the land slope, the crops grown, and the farm machinery used. The ridge height shall include a reasonable settlement factor. The ridge shall have a minimum top width of 3 feet at the design height. The minimum cross-sectional area of the terrace channel shall be 8 square feet for land slopes of 5 percent or less, 7 square feet for slopes from 5 to 8 percent, and 6 square feet for slopes steeper than 8 percent.

Terraces must have a minimum channel cross-section of 8 square feet for terraces up to 500 feet in length, 10 square feet for terraces from 500 to 1000 feet in length, 12 square feet for terraces over 1000 feet in length, and with an overall grade of 0.4 percent. For short distances, terrace grade may vary from 0.2 percent to 0.6 percent to improve alinement. The base must be broad enough to be maintained and farmed on the contour with equipment common to the area. For storage type terraces, grades may be varied to improve alinement. Steeper grades may be permitted near outlets because water storage will reduce the water surface grade.

Spacing of terrace and effective ridge height (measured from top of settled ridge to bottom of channel) shall conform to the table below.

GRADED TERRACE CHANNEL DIMENSIONS
Trapesoidal Cross Section

Field Slope (percent)	Needed Terrace Ridge Height in Feet					May vary + or - 10 Percent horizontal interval in feet
Length in Feet	200	400	600	800	1000	
1	0.8	0.9	1.0	1.2	1.2	260
2	0.8	0.9	1.0	1.2	1.2	160
3	0.7	0.9	1.0	1.2	1.2	127
4	0.7	0.9	1.0	1.1	1.1	110
5	0.7	0.9	1.0	1.1	1.1	100
6	0.7	0.8	0.9	1.0	1.1	93
7	0.7	0.8	0.9	1.0	1.0	89
8	0.7	0.8	0.9	1.0	1.0	85
9	0.7	0.8	0.9	1.0	1.0	82
10	0.6	0.8	0.9	1.0	1.0	80

Figures are settled ridge height and are based on a channel with a 6 foot bottom on a 0.4 percent grade. The same height should be used for a 0.6 percent grade. The height should be increased 0.1 foot for a grade of 0.2 percent. A top width of at least 3 feet should be provided.

CROSS SECTIONAL AREA OF TERRACE CHANNELS

Length of Terrace	Cross-Sectional Area
Feet	Square Feet
500	8
500-1000	10
Over 1000	12

Channel Grade

Channel grade may be either uniform or variable from 0.2 foot per 100 to a maximum grade of 0.6 foot per 100 feet of length. For short distances, terrace grades may be increased to improve alinement. The channel velocity shall not exceed that in chart below.

Type of Vegetation	Feet Per Second
Bare channel:	
Sand and silts	1.5
other	2.0
Poor	3.0
Fair	4.0
Good	5.0

Outlet

All parallel terraces must have an adequate outlet. Such an outlet may be a natural grassed waterway, a vegetated area, or underground conduit. In all cases, the outlet must convey runoff from the terrace or terrace system to a point where the outflow will not cause damage. Terrace outlets shall be installed before terrace construction, if needed, to insure vegetative cover in the outlet channel.

The design elevation of the water surface in the terrace shall not be lower than the design elevation of the water surface in the outlet, at their junction, when both are operating at design flow.

Specifications

Specifications will be in keeping with the preceding standard and will include consideration of the following items:

All dead furrows, ditches, or fullies to be crossed shall be filled before construction begins or as a part of construction. All old terraces, fence rows, and other obstructions that will interfere with the successful operation of the system shall be removed.

The minimum constructed cross section shall meet the design dimensions.

The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement. The opening at the outlet end of the terraces shall have a cross section equal to that specified for the terrace channel.

The finished channel shall contain no depressional areas which would cause ponding of water damaging to crops.

All tillage operations shall be parallel to the terraces.

Consideration shall be given in terraces and outlet layout to machinery operation needs and field terraces.

Storage type terraces with underground conduits shall be designed in accordance with design procedures in the SCS Engineering Field Manual for Conservation Practices.

Cost Sharing

1. Underground outlet and inlet system

   Cost share, when planned and constructed according to the above specifications will be 80 percent of the acutal cost not to exceed 80 percent of the estimated cost.

   Unit Price = $150.00 per inlet
   Maximum Cost Share = $120.00 per inlet

2. Terrace Construction

   Cost share, when planned and carried out according to the above specifications, will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

   Unit Price = $ .60 per lineal foot
   Maximum Cost Share = $ .48 per lineal foot

   Practice will be eligible for payment when terraces are completed.

606 TILE DRAINS (Feet)

Definition

A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water.

Purpose

A drain may serve one or more of the following purposes:

1. Provide drainage for waterways, surface drains, and grass lined swales to protect their erosion control capability.
2. Intercept and prevent water movement into a wet area.
3. Relieve artesian pressures.
4. Remove surface runoff.
5. Serve as an outlet for other drains.

Conditions Where Practice Applies

Drains are used in areas having a high watertable where benefits of lowering or controlling groundwater or surface runoff justify the installation of such a system.

All lands to be drained shall be suitable for agricultural use within their capabilities after installation of required drainage and other conservation practices. The soil shall have enough depth and permeability to permit installation of an effective and economically feasible system.

An outlet for the drainage system shall be available, either by gravity flow or by pumping. The outlet shall be adequate for the quantity and quality of effluent to be disposed of with consideration of possible damages above or below the point of discharge that might involve legal actions under State Laws.

Design Criteria

The design and installation shall be based on adequate surveys and investigations. The Indiana Farm Drainage Guide, Table 1, "Drainage Recommendations for Indiana Soils" shall be followed.

Required Capacity of Drains

The required capacity shall be determined by one or more of the following:

1. The system shall have sufficient capacity to drain all area in the watershed needing drainage.

2. A suitable drainage coefficient including capacity required to dispose of surface water entering through inlets.

3. Survey and comparison of the site with other similar sites where subsurface drain yields have been measured.

4. Measurement of the rate of subsurface flow at the site.

5. Estimates of lateral or artesian subsurface flow.

6. Drainage Field Ditches should be used to remove surface water from the land where feasible for the most economical and satisfactory results.

When an existing main is to be used for an outlet the following shall apply.

CASE I - For areas to be drained that are five (5) acres or less.

This will apply principally to small systems and random lines where complete extensive systems are not needed.

An investigation shall be made of the outlet tile to determine that:

1. It is in good physical condition based on observation of the outlet tile at point of junction.

2. It has adequate capacity based on general observations made in the field. A survey or instrument check of the tile main downstream a distance of 200 to 300 feet from the junction is advisable to determine grade. It will be necessary to continue this check to the outlet unless observations indicate the advisability of such survey.

3. It has sufficient depth to provide minimum cover for all new lines to be installed.

4. The existing tile outlet is adequate, if readily available and nearby.

CASE II - For areas to be drained in excess of five (5) acres.

The investigation shall include the following:

1. A physical inspection of the existing tile to determine that the tile is operative, free from breakdown, and has an adequate outlet.

   The existing tile will be considered adequate if the capacity of the tile, as determined in Step 2, is equal to, or greater than 80% of the required capacity, and if the existing tile is not deteriorated because of holes, quartering, roots or submergence of the outlet, except where such damages are repaired, and/or corrected.

2. Determine the capacity of the existing tile by checking the grades and sizes of the critical areas, particularly the flat reaches.

Definition of Physical Inspection

The physical inspection will constitute the observing of the physical condition of the tile for the following conditions. The physical inspection shall extend from the outlet upward.

1. Breakdowns in the tile line which are usually accompanied by holes in the land over and along the line.

2. Fractured tile, such as quartering of tile (fractures on the quarter points which result in an egg-shape cross-section).

3. Deposition of soil in the tile line. If excessive deposition appears, make a further study to determine the cause and plan for correction.

4. Physical deterioration of the tile material that would seriously subject it to failure, due to high absorption rate, soil acidity, or alkalinity, etc.

If the outlet tile is a drain of record (court drain), all the information available from the record, should be used in making the determination as to the adequacy of the tile outlet.

Size of Drain

The size of drains shall be computed by applying Manning's formula. The required capacity shall be determined as provided above and the size computed based on one of the following assumptions:

1. Hydraulic grade line parallel to the bottom grade of the drain with the drain flowing full at design flow.

2. The drain flowing part full where a steep grade or other condition requires excess capacity.

3. Drain flowing under pressure with hydraulic grade line set by site conditions on a grade which differs from that of the drain. This procedure shall be used only where surface water inlets or nearness of the drain to outlets with fixed water elevations permit satisfactory estimates of hydraulic pressure and flows under design conditions.

The size may be determined from Standard Drawing Number ES-714 (Exhibit 14-11, SCS Engineering Field Manual) or from the "Tile Drain Design Chart" in the Indiana Drainage Guide).

The minimum size of drain shall be four (4) inches in diameter except as follows. The minimum size of drain shall be six (6) inches in diameter for deep organic soils (drainage group 19), and five (5) inches in diameter for sandy soils (drainage group 13) except when drain lengths of thirty (30) feet or longer are used.

Depth, Spacing, and Location

The depth, spacing, and location of the drain shall be based on site conditions including soils, topography, groundwater conditions, crops and outlets.

The minimum depth of cover over subsurface drains in mineral soils shall be 24 inches. This minimum depth shall apply to normal field levels and may exclude sections of line near the outlet, or sections laid through minor depressions where the drain is not subject to damage by frost action or equipment travel, and where site conditions justify specifying other depths.

The minimum depth of cover subsurface soils shall be 30 inches for normal field levels as defined above, after initial subsidence.

Structural measures shall be installed where feasible to control the water table level in organic soils within the optimum range of depths.

The Indiana Drainage Guide, "Drainage Recommendations for Indiana Soils" shall be used as a guide for making determinations of depth, spacing and location.

Minimum Velocity and Grade

Where it is determined that a silting hazard exists, a velocity of not less than 1.4 feet per second shall be used to establish the minimum grades or the Indiana Drainage Guide, "Drainage Recommendations for Indiana Soils" may be used, if site conditions permit. Provisions shall be made, for prevention of siltation by filters as recommended in the Indiana Drainage Guide, and collection and removal of silt by use of silt traps when specified in the plans.

In areas with no rapid siltation hazard the minimum grade will be as follows, except where tile is also used for subsurface irrigation or unusual site conditions exist:

4 inch diameter	0.10%
5,6,7 inch diameter	0.07%
8,10 inch diameter	0.06%
12 inch diameter and over	0.05%

Maximum Grade and Protection

On sites where topographic conditions require the use of drain lines on grades steeper than two percent or where design velocities will be greater than indicated in the table below, special measures shall be used to protect the drain. These measures shall be specified for each job based on the particular conditions of the job site. The protective measures shall be specified for each job based on the particular conditions of the job site. The protective measures shall include one or more of the following:

1. Use only drains that are uniform in size and shape and with smooth ends.

2. Lay the drain so as to secure a tight fit with the inside diameter of one section matching that of the adjoining sections.

3. Wrap open joints with tar impregnated paper, burlap, or special filter material such as plastic or fiber-glass fabrics.

4. Select the least erodiable soil available for blinding.

5. Tamp blinding material carefully around the drain before backfilling.

6. Seal joints or use a watertight pipe.

7. For continuous pipe or tubing with perforations, completely enclose the pipe with filter material of plastic, fiber glass, or properly graded sand and gravel.

Maximum Permissible Velocity in Drains Without Protective Measures

SOIL TEXTURE	VELOCITY-FT./SEC.
Sand and Sandy Loam	3.5
Silt and Silt Loam	5.0
Silty Clay Loam	6.0
Clay and Clay Loam	7.0
Coarse Sand or Gravel	9.0

Materials for Drains

"Drains" include conduits of clay, concrete, bituminized fiber, metal plastic, or other materials of acceptable quality.

The conduit shall meet strength and durability requirements of the site. Current specifications as listed below or as included in the specifications guide shall be used in determining the quality of the conduit.

The minimum standards shall be those currently established for "Standard Drain Tile" by ASTM.

The following specifications cover the products currently acceptable for use as drains of for use in determining quality of materials used in drainage installation:

TYPE	SPECIFICATION
Clay, drain tile	ASTM C 4
Clay, drain tile, perforated	ASTM C 498
Clay sewer pipe, standard strength	ASTM C 13
Clay pipe, extra strength	ASTM C 200
Clay pipe, perforated, standard and extra strength	ASTM C 211
Clay pipe, testing	ASTM C 301
Concrete drain tile	ASTM C 412
Concrete pipe for installation of drainage	ASTM C 119
Concrete pipe or tile, determining physical properties of	ASTM C 497
Concrete sewer, storm drain, and culvert pipe	ASTM C 14
Reinforced concrete culvert, storm drain and sewer pipe	ASTM C 76
Perforated concrete pipe	ASTM C 444
Portland cement	ASTM C 150
Asbestos-cement nonpressure sewer pipe	ASTM C 428
Asbestos-cement perforated underdrain pipe	ASTM C 508
Asbestos-cement pipe, testing	ASTM C 500
Bituminized fiber, perforated drainage pipe	Federal Spec.2 SS-P-358a

[1]American Society for Testing and Materials, 1916 Race Street Philadelphia, Pennsylvania 19103

[2]Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

TYPE	SPECIFICATIONS
Homogeneous perforated bituminized fiber pipe for general drainage	ASTM D 2311
Homogeneous bituminized fiber pipe, testing	ASTM D 2314
Laminated-wall bituminized fiber perforated pipe for agricultural, land, and general drainage	ASTM D 2417
Laminated-wall bituminized fiber pipe, physical testing of	ASTM D 2315
Plastic drain and sewer pipe, styrene rubber Perforations, if needed, are to be as specified in Fed. Spec. SS-P-358a	Commercial Standard[2] CS-228
Plastic drainage tubing, corrugated	refer to Specification Guide, page 606-12
Pipe, corrugated, aluminimum allow	Federal Spec. WW-P-402a
Pipe, corrugated, iron or steel, zinc coated	Federal Spec. WW-P-00405

Concrete Tile - The use of concrete tile under acid and sulfate conditions shall be in accord with the following guides:

ACID SOILS

Class of tile	Lower Permissible Limits of pH Values[3]	
	Organic and Sandy Soils	Medium and Heavy Textured Soils
ASTM C 412:		
Standard Quality	6.5	6.0
Extra Quality	6.0	5.5
Special Quality	5.5	5.0
ASTM C 14, C 118, C 444	5.5	5.0

[3]Figures given represent lowest reading of pH values for soil water or soil at tile depth.

Other Clay and Concrete Pipe - Bell and spigot, tongue and groove, and otherpipe which meets the strength, absorption, and other requirements of clay or concrete tile as covered above, except for minor imperfections in the bell, the spigot tongue or the groove, and ordinarily classed by the industry as "seconds" may be used for drainage conduits provided the pipe is otherwise adequate for the job.

Foundation Requirements

Soft or yielding foundations shall be stabilized where required and lines protected from settlement by adding gravel or other material to the trench, placing the conduit on plank or other rigid supports, or using long sections of perforated or watertight pipe.

Loading

The allowable loads on drain conduits shall be based on the trench and bedding conditions specified for the job. A factor of safety of not less than 1.5 shall be used in computing the maximum allowable depth of cover for a particular type of conduit. Bedding requirements shall be specified in accordance with the specifications guide. To determine maximum trench depths Table 14-6 of the SCS Engineering Field Manual of Table 4 of the Indiana Farm Drainage Guide may be used.

Filters and Filter Material

Suitable filters shall be used around drains where recommended in the Indiana Farm Drainage Guide, "Drainage Recommendations for Indiana Soils," to prevent sediment accumulation in the conduit.

Not less than three inches of filter material shall be used for sand-gravel filters. A recommended method of installation is to place filter material to a depth of three inches under the drain, and cover the drain and filter with a sheet of plastic. The filter shall be designed to prevent the material in which the installation is made from entering the drain. Not more than ten percent of the filter shall pass the #60 sieve.

Where fiber-glass filter material is used, it shall be manufactured from borosilicate type glass and the manufacturer of the material shall certify that it is suitable for underground use. The fibers shall be of variable size, with some larger fibers intertwined in the mat in a random manner. The material shall cover all open joints and perforations.

Blinding Material

Top soil shaved from the side of the trench or equally friable soil shall be used to blind the drain for those soils that filters are not recommended.

Envelopes and Envelope Material

Envelopes shall be used around drains where required for proper bedding of the conduit, or where necessary to improve the characteristics of flow of ground water into the conduit.

Materials used for envelopes do not need to meet the gradation requirements of filters, but they shall not contain materials which will cause an accumulation of sediment in the conduit or render the envelope unsuitable for bedding of the conduit.

Auxiliary Structures and Drain Protection

The outlet shall be protected against erosion and undermining of the drain, against damaging periods of submergence, and against entry of rodents or other animals into the drain. A continuous section of pipe without open joints or perforations shall be used at the outlet end of the line and shall outlet above the normal elevation of low flow in the outlet ditch.

The pipe and its installation shall conform to the following requirements:

1. Where there is a hazard of burning to vegetation on the outlet ditch bank, the material from which the outlet pipe is fabricated shall be fire resistant. Where the hazard of burning is high, the outlet pipe shall be fireproof.

2. Two-thirds of the pipe shall be buried in the ditch bank and the cantilevered section shall extend beyond the toe of the ditch side slope or the side slope shall be protected from erosion. The minimum length of pipe shall be ten feet.

3. Where ice or floating debris may damage the outlet pipe, the outlet shall be recessed to the extent that the cantilevered portion of the pipe will be protected from the current in the ditch.

4. Headwalls which are used for drain outlets shall be adequate in strength and design to avoid washouts and other failures.

Conduits under roadways shall be designed to withstand the expected loads. Shallow drains through depressional areas and near outlets shall be protected against hazards of farm and other equipment, and freezing and thawing.

Junction boxes shall be used where more than two main lines join.

Where surface water is to be admitted to drains, inlets shall be designed to exclude debris and prevent sediment from entering the conduit. Drain lines flowing under pressure shall be designed to withstand the resulting pressures and velocity of flow. Auxiliary surface waters shall be used where feasible.

Installation

Specifications shall be in keeping with the preceding standard, shall describe the requirements for proper installation of the practice to achieve its intended purpose, and shall include consideration of the following items:

Inspection and Handling of Material

Material for drains shall be given a rigid inspection before installation. Where applicable, clay and concrete tile shall be checked for damage from freezing and thawing prior to installation. Bituminized fiber and plastic pipe and tubing shall be protected from hazards causing deformation or warping. All material shall be satisfactory for its intended use and shall meet applicable specifications and requirements.

Placement

All drains, both flexible as plastic tubing and non-flexible as clay and concrete tile, shall be laid to line and grade and covered with approved blinding, envelope, or filter material to a depth of not less than three (3) inches over the top of the drain the same day that the drain is laid. Either of the two methods below may be used.

1. Except as provided in Method 2 below, the bottom of the excavated trench shall be shaped or grooved. Flexible type drains, when placed, shall be embedded in undisturbed soil for approximately 60 degrees of their circumference. After placement of all types of drains, friable material taken from the trench spoil or cut from the trench side walls shall be placed around the drain in such a manner that it will completely surround and support the drain and fill the trench to a depth of three inches over the top of the drain. To be suitable, materials surrounding the drain must contain no hard clods, rocks, or fine materials which would cause a silting hazard in the drain.

2. When special shaping or grooving of the trench bottom is not provided to embed the drain when placed, the drain shall be laid directly upon the flat, unshaped bottom and both sides

covered with an envelope material of sufficient quantity to fill the trench to a depth of three inches over the top of the drain. Envelope material shall consist of sand-gravel material, all of which shall pass a 1-1/2 inch sieve, 90 to 100 percent shall pass the 3/4 inch sieve, and not more than 10 percent shall pass the no. 60 sieve.

When a filter is required, all openings in the drain shall be covered by the filter, or approximately the lower half of the drain is to be covered by the filter and the rest of the drain covered by a sheet of impervious plastic. No portion of the drain containing openings is to be left exposed under conditions which require the use of a filter.

When sand-gravel filter material is used, the trench shall be over excavated three inches and backfilled to grade with filter material. After placement of the drain upon the filter material, additional filter material shall be placed over the drain to fill the trench to a depth of three inches over the drain. A plastic sheet and friable soil can be used in lieu of filter material as the backfill over the drain when specified. The sand-gravel filter material shall be a mixture of sand and gravel within the gradation required by the base material in the trench.

The gap between tile or other drain pipe joints shall not exceed 1/4 inch for mineral soils or 1/2 inch for organic soils. Openings wider than these, occuring on the outer side of a curve in a tile line or due to tile irregularity, shall be permitted if they are covered with broken tile, fiber glass, or other suitable material.

The upper end of each drain tile shall be capped with concrete or other durable material unless connected to a structure.

Earth backfill material shall be placed in the trench in such a manner that displacement of the drain will not occur and so that the filter and bedding material, after backfilling, will meet the requirements of the plans and specifications.

No reversals in grade of the conduit shall be permitted.

Where the conduit is to be laid in a rock trench, or where rock is exposed at the bottom of the trench, the rock shall be removed below grade enough that the trench may be backfilled, compacted, and bedded; and when completed, the conduit shall not be less than two inches from rock.

Materials Specifications

All materials currently acceptable for installation as Drains are listed in the standard. The specifications for use in determination of

the physical requirements and testing of all the physical requirements and testing of all of the approved materials on pages 606-6&7.

Specifications for corrugated plastic drainage may be obtained from the State Conservation Engineer.

General

The installing contractor shall name the source of materials used and complete IN-229 Tile Installation Report, where applicable.

Working Tools and References

Working tools and references are to be used as guides along with local experience in planning and installing drains, except when the working of this standard indicates that they shall be used, in those cases, the specific table, figure or part referred to becomes a part of this standard.

SCS Engineering Field Manual for Conservation Practices, SCS National Engineering Handbook, Chapter 16; Drainage Farm Drainage - USDA Farmers Bulletin 2046, Subsidence of Muck Soil in Northern Indiana, SCS-366, Purdue Indiana Farm Draining Guide - Purdue.

Cost Sharing

Cost share, when planned and carried out according to the above specifications, will be 70 percent of the actual cost not to exceed 70% of the estimated cost.

Unit Price = $.40 per linal foot
Maximum Cost Share = $.28 per lineal foot

Tile breathers and relief wells will be eligible for cost share when their need is certified by the responsible SCS Technician. Cost share will be 70% of the actual cost not to exceed 70% of the estimated cost.

Unit Price = $20.00 per installation
Maximum Cost Share = $14.00 per installation

Practice is eligible for cost share when the waterway, surface drain, or grass swale is completed and tile is installed.

NOTE: For diversion and terrace outlet systems see Specification 362 (Diversion) 600 and 604 (Terraces, Parallel & Gradient).

612 TREE PLANTING (Acres)

Definition

Planting tree seedlings or cuttings.

Purpose

To establish or reinforce a stand of trees to conserve soil and moisture; beautify an area; protect a watershed; or produce wood crops.

Where Applicable

In open fields, in understocked woodland, beneath less desirable tree species, or on other areas suitable for producing wood crops; where erosion control or watershed protection is needed; where greater natural beauty is wanted; or where a combination of these is desired.

Specifications

1. Plant best adapted species for a given soil and site condition to accomplish the owners planting objective.

2. Site preparation is required only on areas where very heavy sod cover is established. When planting in heavy grass areas of fescue or bluegrass, plow shallow furrows, on contour where erosion is a hazard, and plant trees in the furrows. On tree planting machines equipped with a scalper, plowing is unnecessary.

3. Areas selected for planting must be at least one-half acre in size.

4. Plantings must be protected from fire and grazing.

5. Chemicals used in performing this practice must be federally and locally registered and must be applied strictly in accordance with authorized registered uses directions on the label, and other federal or state policies and requirements.

6. Spacings for plantings:

   a. Bare erosion and gully areas 6' x 6', 1210 per acre.

b. Non-active erosion areas, reinforcement plantings, underplantings for stand conversion, and reforestation of open field where weed and grass control will not be carried out. 8' x 8', 681 per acre.

c. Hardwood plantings where grass and weed control will be carried out by use of farm machinery and/or chemicals.

10' - 10'	436 trees per acre
12' - 12'	304 trees per acre
14' - 14'	222 trees per acre
16' - 16'	170 trees per acre

This variation in spacing is allowed so that trees can be spaced to fit equipment planned for use in cultivation, maintenance, etc.

7. This practice will further allow the addition of approved shrubs or trees to regular planting for beautification and wildlife improvement. The allowable inclusion of shrubs in plantings shall be a maximum of 100 shrub-type plants per acre of planting.

a. Shrubs must be planted in outside rows of plantation, or along planned access roads or firebreaks through the plantation.

b. The following trees and shrubs, in addition to those named in the "State Tree Planting Guide", are approved for Indiana use:

Dogwoods	Bush Honeysuckle
Redbud	Serviceberry
Flowering Crabapples	Bush Lespedeza

c. Spacing of trees and shrubs added for beautification should be 8' x 8' to allow better flowering and fruit development.

8. All planting of trees and shrubs in Indiana will be done in the spring of the year, preferably March, April and early May.

9. Any deviation of species from the attached, Tree Planting Guide or approved list for beautification must have approval of responsible technician, prior to being eligible for cost sharing.

TREE PLANTING GUIDE - Black Creek Project

Planting Groups	Slopes Facing NE None to Moderate Erosion, Some Topsoil	N & E Slopes Severe Erosion Subsoil and Parent Material	S & W Slopes None to Moderate Erosion, Some Topsoil	S & W Slopes Severe Erosion, Subsoil and Parent Material	Windbreaks Farmstead and Field Plantings
Loamy soils with good root, air and water relationship. No planting restrictions except percent of slope, aspect, and erosion. (Woodland Suitability Groups 1,2,3,4, & 8) Examples: Miami, Ockley, Russell, Negley, Hennepin, Genesee, Eel, Pope, etc.	White Pine Red Pine Black Walnut 1/ Black Locust 2/ Tulip Tree 1/ White Ash	Red Pine Black Locust 2/ Shortleaf Pine Scotch Pine 3/	Red Pine Black Locust 2/ White Pine Shortleaf Pine Tupip Tree 1/ Black Walnut White Ash 1/	Virginia Pine Black Locust 2/ Jack Pine Scotch Pine 3/ Austrian Pine 3/ E. Black Alder	White Pine Norway Spruce Red Pine Autumn Olive Amur Honeysuckle Black Haw Lilacs Mockorange
Soil ranging from somewhat poorly to poorly drained. Occasional ponding or overflow and all have seasonal high water tables. (Woodland Suitability Groups 5,11 and 13) Examples: Avonburg, Crosby, Brookston, Clermont, Sloan, Stendal, Wakeland, etc.	White Pine Sycamore 1/ Red Maple 1/ White Ash 1/ Cottonwood 1/ Loblolly Pine Bald Cypress Sweet Gum 1/ E. Black Alder	Same throughout as slope and erosion of minor importance			White Pine Norway Spruce Arborvitae Laurel Leaf Willow Medium Purple Willow Gray Dogwood Silky Dogwood

Planting Groups	Slopes Facing NE None to Moderate Erosion, Some Topsoil	N & E Slopes Severe Erosion Subsoil and Parent Material	S & W Slopes None to Moderate Erosion, Some Topsoil	S & W Slopes Severe Erosion, Subsoil and Parent Material	Windbreaks Farmstead and Field Plantings
Sandy soils with very low water holding capacity and having a hazard of wind erosion. (Woodland Suitability Group 17) Examples: Bronson, Brems, Oshtemo, Plainfield, Tracy, Tyner, etc.	White Pine Red Pine Jack Pine Scotch Pine 3/ Austrian Pine 3/	Red Pine Jack Pine	Red Pine White Pine Jack Pine Scotch Pine 3/ Austrian Pine 3/	Jack Pine Red Pine	White Pine Red Pine Jack Pine Hazelnut Autumn Olive
Sites consisting of miscellaneous land types, such as strip mines, strip spoils, and dumps, clay pits, and other disturbed lands. (Woodland Suitability Group 16)	Erosion cannot be mapped on these sites and exposure is of only minor importance. Plantings will therefore be based on pH ratings of sites:				
	pH 5.5-7.0	pH 4.0-5.5	pH below 4.0		
	Sweet Gum Tulip Tree Black Walnut Sycamore Cottonwood White Pine E. Black Alder Bald Cypress	Sweet Gum E. Black Alder Sycamore River Birch Jack Pine Virginia Pine Pitch Pine White Pine Bald Cypress	No planting Delay until leaching causes a rise in pH to 4.0 or better		White Pine Jack Pine Virginia Pine (based on pH) Autumn Olive Amur Honeysuckle

1/ Hardwoods are recommended for undisturbed sites in woodland openings or for wide-spaced plantings in old fields where weed control can be accomplished.

2/ Fence post production only.

3/ For Christmas tree production only.

Cost-Sharing

Cost-share, when planned and established according to the above specifications, will be 80% of the actual cost involved not to exceed 80% of the estimated cost.

Where production from livestock is needed, fencing as planned and installed will be cost-shared in accordance with practice 472, Livestock Exclusion.

Plantings of over 1200 trees will be referred to the Service Forester, Division of Forestry, Indiana Department of Natural Resources for technical assistance. All hardwood tree planting request will be referred to the Service Forester.

Unit Price = $80.00 per acre
Maximum Cost-Share Rate = $64.00 per acre

Practice is eligible for payment when trees are planted, and protected if necessary.

644 WILDLIFE WETLAND HABITAT MANAGEMENT (Acres)

Definition

Retaining, creating, or managing wetland habitat for wildlife.

Purpose

To preserve, create, or improve habitat for waterfowl, furbearers or other wildlife.

Where Applicable

On existing wetlands and on lands where water can be impounded or regulated by diking, ditching, or flooding.

Specifications

Furbearers

1. Impoundments with water control structures.

    a. Construct a water control structure that will permit water levels to be controlled from 12-36 inches.

    b. Maintain water level at about 12 inches during the growing season to encourage the growth of cattails, bulrush, sedges, bur reed, arrowhead, and other aquatic plants useful as muskrat food.

    c. Gradually raise water level to maximum depths, starting September 1 to make these food plants available to furbearers and prevent winter freeze out.

    d. For types and sizes of structures required use applicable service specifications. Stop-log type of structures are recommended.

2. Impoundments without water control structures.

    Construct an earth fill dam without a mechanical spillway. These are less affective than the structures described above. On such areas at freezeup time a depth of 36 inches shall cover at least 20 percent of the area. Additional shallow pits may be constructed in the

shallower parts of the impoundment. Such pits will have a minimum water depth of 36 inches.

Waterfowl

1. Shallow Water Development

Construct dikes or levees on relatively level land according to Standards and Specifications for Class III Dikes. (See Engineering Specifications - 356 for design criteria). Install a water level control which will permit sufficient drainage for crop production and permit flooding from 1 to 15 inches. A source of water shall be sufficient to maintain desired water levels.

a. Open Areas

Plant to duck food plants such as browntop millet, buckwheat, Japanese millet, soybeans, smartweeds, or corn; or utilize crop fields after harvest. Flood to a depth of 1 to 15 inches when fall duck migration begins.

b. Woodland

Create greentree reserviors by diking wooded areas where oaks are the dominant species (pin oak is the most desirable species). Flood to a depth of 1 to 15 inches from the middle of October until March. Woodlands must be drained during the growing season to prevent injury to trees.

2. Development or Preservation of Existing Marshes or Impoundment Without Controlled Water Levels.

To provide open water areas for ducks, depth of water must be a least 3-1/2 feet deep over at least 25 percent of the area (maximum of 75 percent) to control emergent vegetation. One or more of the following methods may be used to improve water levels and provide open water.

a. Where possible in existing marshes, construct a low level dam or water control structure to impound water at least 3-1/2 feet deep over at least 25 percent of the area. See Engineering Specifications 587 and 356.

b. Construct pits or dugouts by blasting, with dragline, or by other means at rate of one to each 1 to 5 acres of marsh.

(1) Where runoff water is lacking, pits must be located where water table is normally within 2 feet of the ground surface.

(2) Pits dependent upon runoff water shall be constructed in watersheds which will maintain desired water levels.

(3) Construct pits with a minimum surface area of 500 sq. ft. and a maximum of 5,000 sq. ft. Depth shall be at least 3-1/2 ft. over at least 25% of the area.

(4) Twenty-five percent of shoreline shall have a slope of 5:1 or flatter.

c. Construct level ditches according to the following specifications:

(1) Ditches will be constructed without grade where ground water levels will permit maintaining a water depth of 3-1/2 to 4 feet.

(2) Ditches will have a minimum bottom width of 4 feet with side slopes no flatter than 2:1. Side slopes of 1:1 will be permissible in peat or muck soils.

(3) Ditches should be parallel and, if possible, at right angles to prevailing wind. Parallel ditches will be spaced from 100 - 400 feet apart with optimum spacing of 200 feet.

(4) Excavated material will be deposited on alternate sides of the ditch, staggering the spoil bank at approximately 50 feet intervals. The spoil bank will not be leveled. A berm at least 10 feet in width shall be left between the edge of the ditch and the toe of the spoil. Spoil and berm will be seeded to adapted grasses and legumes. See Standard of Critical Area Planting.

d. Where none of these methods is practicable, maintain existing wetlands by:

(1) Protecting from fire or grazing.

(2) Control unwanted woody or other vegetation by mowing, cutting, use of herbicides or other means.

3. Islands for loafing, nesting, resting, or duck blinds.

May be constructed at rate of 1 island per 2 to 4 acres of ponded area.

a. Minimum size - 20 feet diameter with a settled height no less than 2 feet above the water level.

b. Seed to adapted grasses and legumes. See Standard of Critical Area Planting.

c. Twenty-five percent of shorelines will be sloped 5:1 or flatter.

4. Loafing sites

Three sites per surface acre of water are recommended. In shallow water, provide firm objects such as rocks or bales of hay or straw. In deep water, anchored floating logs or rafts (4'x4') may be used.

Cost Sharing

Cost sharing when the practice is planned and established according to the above specifications will be as follows:

a. Impoundments for furbearers

(1) Impoundments with water control structures:

Cost share will be 70 percent of the actual cost of earth moving and structural measures not to exceed 70% of the estimated cost. Design and installation must meet the technical approval of both the engineer and biologist.

Unit Price = $800.00 per acre
Maximum Cost Share = $560.00 per acre of impounded area

(2) Impoundments without water control structures

Cost share will be 70 percent of the actual cost of construction not to exceed 70 percent of the estimated cost. Design and installation must meet the technical approval of the engineer and biologist.

Unit Price = $400.00 per acre
Maximum Cost Share = $280.00 per acre of impounded surface area

b. Development for waterfowl

(1) Shallow water development

a. Earth moving and structural works

Cost share will be 70 percent of the actual cost of earth moving and structural measures not to exceed 70 percent of the estimated cost.

Unit Price = $800.00 per acre
Maximum Cost Share = $560.00 per acre

b. Food planting following water development

Cost share for wildlife food plantings following water development will be 70 percent of the average cost of $50.00 per acre.

Unit Price = $50.00 per acre
Maximum Cost Share = $35.00 per acre

(2) Development or preservation of existing marshes or impoundments without controlled water levels

Cost share will be 70 percent of the actual cost not to exceed 70 percent of the estimated cost.

Unit Price = $300.00 per acre
Maximum Cost Share = $210.00 per acre of marshland developed or impounded

(3) Islands

Islands will be cost shared at 70 percent of the actual cost involved not to exceed 70 percent of the estimated cost.

Unit Price = $50.00 per acre
Maximum Cost Share = $35.00 per acre of ponded area served

Practices are eligible for payment when the work is completed.

645 WILDLIFE UPLAND HABITAT MANAGEMENT (Acres)

Definition

Retaining, creating, or managing wildlife habitat other than wetland.

Purpose

To preserve, establish or improve habitat for desired kinds of wildlife. Wildlife includes both game and non-game species.

Where Applicable

On sites (other than wetland) that are suitable for desired kinds of wildlife food or cover plants and that can be protected from fire and grazing. Upland wildlife habitat management may be applicable on any capability subclass depending upon the desires of the land use decision maker. It will include one or more of the following, but is not limited to:

1. The 40 foot border of woodland next to open areas such as fields, highways, and open water areas. No grazing of woodland borders or pond banks.

2. Field corners, field edges, sink holes, escarpments, small pieces of land that cannot be conveniently cropped, inaccessible odd areas, roadsides, eroded sites, road corners, open drainage mains and laterals, utility, and in other areas. Habitat within cropland field borders may be grazed lightly after August 1, or earlier grazing not oftener than one year out of three.

3. Areas adjacent to water impoundment, berms along stream banks, along ditch banks, berms, or spoils and other areas.

4. Conversion of cropland to wildlife land as a desired land-use change by the landuser.

Specifications

A. Cottontail Rabbits, Bobwhite Quail, and Songbirds

   1. Nesting cover - Herbaceous

      a. Establish or retain existing grassy or herbaceous cover as needed on up to 40 percent of the total land area.

Nesting cover especially needed in land resource areas which are predominately cultivated or mostly woodland.

b. Use any adapted mixture of grasses and/or legumes and allow some native species to volunteer. A timothy-clover mixture is recommended if site is suitable. Follow establishment procedures in Pasture and Hayland Planting Specifications or Critical Area Planting Specifications. Mow about one-third (1/3) of the sod areas each year. Rotate so total area is covered every three years. Mow after August 1 to control brush, and to provide both short and tall herbaceous cover for fall and winter use.

2. Woody Cover and Travel Lanes

a. Retain existing brushy areas and hedgerows on up to 20 percent of the total land area. Such woody cover can be improved by cutting trees over two (2) inches in diameter and retaining shrubs, briars, and vines.

b. In established woodlands leave trees, shrubs or vines within the 40-foot border of the woodland next to open land except mature merchantable trees. When mature trees are harvested, leave tops and limbs to form a loose brush pile.

c. Establish single or double row of shrubs at field edges or divisions along ditch banks or wherever travel lanes are needed. Use to divide fields 40 acres in size or larger. Plant adapted shrubs. See specifications for Hedgerow Planting for species and spacing.

d. Plant clumps of conifers or shrubs in fence corners, odd areas, around ponds, or adjacent to food or nesting cover. (For the tree, shrub, and soils information, see Woodland Technical Note #6 - Planting Guide for Trees and Shrubs for Outdoor Living).

e. Food

Waste grain from cropfields located near suitable cover usually supply needed food. Otherwise, establish food plots or strips near woody cover at least 1/8 acre in size using corn, wheat, soybeans, sorghum, millet, buckwheat, or mixture of these. Rotate food plots and allow to lie fallow 2nd and 3rd year. Where adapted, overseed with Korean or other annual lespedezas.

3. Converting Cropland to Wildlife Land

   a. Prepare a suitable seedbed and lime and fertilize as needed.

   b. Establish alternate strips of short and tall herbaceous cover laid out across the slope on or near the contour. Strips of short cover should be about 50 to 100 feet wide, and tall cover about 25 to 50 feet wide. Use grass legume mixtures where possible, and allow some native species to volunteer.

   c. Mow selectively only as needed to control noxious weeds and unwanted woody species. Flushing strips may be mown annually for hunting. Avoid mowing all the field at one cutting. Mow only as needed and then alternating strips on a two or three year interval.

   d. Larger fields should include some strips of row crops such as corn or sorghum for summer loafing, dusting, and drying; and for winter food.

   e. Some woody cover should be available or established in the form of clumps, blocks, hedgerows, fencerows or woodland edge.

B. Songbirds

The Item A. specifications above are good for songbird habitat in a rural landscape. Songbirds can be attracted to homesites by tree and shrub plantings. Plan a diversity of plant forms, food producers, and shelter plants. Small lawns may limit choice to single specimen plants to get the variety preferred by birds. Locate some food producers where they can be observed from a window, patio, or terrace. Choose a variety of plants including some reported to have medium or higher "bird use" for best results. Also choose a few for length of "months in fruit." Some attractive food producers are grouped below by rate of "bird use", and secondly they are listed (within groups) according to their availability from nurseries.

SHRUB NAME	MONTHS IN FRUIT	BIRD USE
Cardinal Autumn Olive	Sept. - Fed. (6)	Heavy
Gray-Stemmed Dogwood	Aug. - Nov. (4)	Heavy
Flowering Dogwood	Sept. - Fed. (6)	Heavy
Elderberry	Aug. - Oct. (3)	Heavy (very)
Crabapple	Sept. - Apr. (8)	Medium
Washington Hawthorne	Sept. - May (9)	Medium
Black Haw	Aug. - Mar. (8)	Medium
Highbush Cranberry	Sept. - May. (9)	Light
Firethorn	Sept. - May. (9)	Light
Sumac	Sept. - May. (9)	Light

C. Ring-necked Pheasants and Hungarian Partridge

1. Nesting Cover

Same as for quail above, except a smooth brome-alfalfa mixture is recommended where soils are suitable.

2. Winter Cover and Travel Lanes

Retain existing brushy areas, marshlands, and existing hedgerows. Establish a single or double row of shrubs or conifers in field edges, along ditch banks, or whenever winter cover or travel lanes are needed. See specification for Hedgerow Planting for spacing. Use adapted species such as red pine, white pine, red cedar, Norway spruce, gray or silky dogwood, autumn olive, japonica lespedeza, or amur honeysuckle. Multiflora rose is a good wildlife plant and may be used when surrounded by intensively managed lands such as cropland and where the plant will be managed to control volunteer plants.

3. Food

Plant food plots near winter cover at least 1/4 acre in size using corn, wheat, sorghum, buckwheat, millet, or soybeans. Food plots may lie fallow 2nd and 3rd year. Use appropriate cultural practices in seedbed preparation and seeding.

D. White-tailed Deer and Ruffed Grouse

1. Cover

Deer and Grouse are considered woodland species. Normal woodland practices such as harvest cutting on a rotation basis, fire protection and livestock exclusion ususally provide adequate cover.

2. Food

a. Manage woodlands to favor oaks and fruit-bearing trees, shrubs and vines such as dogwood, persimmon, crabapple, hawthorne, viburnums, smilax, and wild grape. Encourage shrub and sprout growth in woodland edges.

b. Plant trails and openings to ladino clover, Korean lespedeza, or other adapted legumes; or encourage and maintain native grasses and forbs.

c. Leave corn unharvested or plant corn or food plots at least 1/4 acre in size near woody cover.

3. Water

Develop springs or seeps; or build water holes or small ponds. See specification for Wildlife Watering Facility.

E. Squirrels

1. Food

Manage woodlands to favor oaks, hickories, beech, and other fruit or mast producing trees and shrubs. Leave unharvested corn or plant corn in food plots at least 1/4 acre in size near woodland edges or fencerows. This is especially important in years of poor mast production.

2. Den Sites

Where den sites are not available, place den boxes in trees at a height of at least 20 feet above the ground to furnish 2-3 dens per acre of woodland. Use natural material such as slabwood.

F. Other Factors to Consider

1. Strive for interspersion, edge, and diversity.

2. The greater the diversity of the environment and the more stable the ecosystem.

3. Most other native upland birds and mammals, respond favorably to the practices described above.

Cost Sharing

Cost share, when established according to the above specifications, will be as follows:

1. Nesting Cover - Herbaceous

Cost share for establishing grassy and/or herbaceous cover on lands planned for wildlife use for nesting cover will be 65% of the estimated average cost of $70.00 per acre for the net acres seeded.

Unit Price = $70.00 per acre
Maximum Cost-Share Rate = $45.50 per acre

2. Woody Cover and Travel Lanes

Cost share for establishing a single or double row of shrubs will be 65% of the actual cost involved not to exceed 65% of the estimated cost.

Unit Price = $80.00 per acre
Maximum Cost Share = %52.00 per acre

3. Clump Plantings

Cost share for clump plantings of conifers or shrubs will be 65% of the actual cost involved not to exceed 65% of the estimated cost.

Unit Price = $80.00 per net acres planted
Maximum Cost Share = $52.00 per acre

4. Food Plots

Cost share for establishing food ... will be 65% of the average cost of $70.00 per acre. Cost share will be based on net acres of food plots established.

Unit Price = $70.00 per acre
Maximum Cost Share = $45.50 per acre

5. Converting Cropland to Wildlife Land

Cost share will be 80% of the estimated average cost of $70.00 per acre.

Unit Price = $70.00 per acre
Maximum Cost Share = $56.00 per acre

When protection from livestock is needed for lands planned for wildlife use, fencing as planned and installed will be cost shared in accordance with practice 472 Livestock Exclusion.

Practice will be eligible for payment when area is seeded or trees and shrubs are planted and protected, where needed.

654 WOODLAND IMPROVED HARVESTING (Acres)

Definition

Systematically removing some of the merchantable trees from an immature stand or all trees from a designated part of a woodland.

Purpose

Harvesting mature crop trees in such a way as to encourage proper regeneration of desirable species.

To harvest some of the merchantable trees from an immature stand to improve the conditions for forest growth and/or harvest trees in a manner that encourages the regeneration and normal development of a new stand.

Cutting in immature plantations or natural stands to provide optimum growing conditions for retaining crop trees.

Where Applicable

Where the site, size, species, and density of a forest stand makes the planned and systematic harvesting of trees economically and silviculturally feasible for improving the growth of the remaining trees or to regenerate the stand.

Where adequate protection from fire and livestock damage can be provided for remaining trees and future regeneration.

Specifications

This practice will apply only to areas where long-time land use is for production of woodland crops.

1. This practice will include cuttings made in any hardwoods or conifers of economic importance where materials are removed for owner's use or sale.

2. A crop tree will be considered mature when it has reached its maximum rate of growth and now shows indication of decline in vigor. Site, soil, and stand conditions will govern maturity size.

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3. Harvesting of woodland crops should definitely be correlated to soil-site potential for the area cut. (Section III-E-1 of Technical Guide).

   a. Low potential sites (Site-index 70 or less).

      Maturity is reached at rather small diameter for most species on these sites.

      Woodland improved harvesting on these areas could be of a regeneration type (clear-cut by blocks) for pulpwood, cross-ties, or pallet materials.

   b. High potential sites (Site-index above 70)

      Maturity of crop trees would be saw log or veneer log size.

      Improved type of cutting would be made to increase quality and quantity of future wood crops.

      Type of cutting on the better sites would be controlled largely by the desired type of reproduction, size of area, and owner's desires.

4. Cuttings in immature stands or plantations.

   a. Most pine plantations will need an intermediate (thinning) cut around 15 to 25 years after planting. In order for crop trees to continue at a good growth rate, they need additional growing space at this age. It is intended for this practice to cover this type of cut only when removed materials are sold or utilized for wood products.

   b. Black walnut plantings have proven the need of ample space to keep up growth on quality crop trees. A spacing of D+8 should be considered for thinnings.

Maintenance

1. Logging roads or access roads should be cleared of any logging debris, and maintained for fire protection. Erosion control by seeding or installation of cut-off ditches may be needed.

2. When intermediate cuttings are made in pine stands, it may be necessary to spray stumps with chemicals to control insect buildup and damage to remaining crop trees.

3. Continued protection from fire and livestock damage is very important to production of future woodland crops.

Cost-Sharing

Cost-share will be 65% of the average cost of $15.00 per acre when performed according to the above specifications and according to the recommendations of the Service Forester, Division of Forestry, Indiana Department of Natural Resources. These recommendations may include woodland improvement work after the harvest cutting is done. This additional work must be done before cost-share is eligible under Woodland Improved Harvesting or Woodland Improvement.

Unit Price = $15.00 per acre
Maximum Cost-Share Rate = $9.75 per acre

666 WOODLAND IMPROVEMENT (Acres)

Definition

Improving woodland by removing unmerchantable or unwanted trees, shrubs, or vines.

Purpose

To fully use the potential of a site; to maintain plant cover for soil protection; to improve stand composition by leaving the best trees, spaced for best growth; or to improve the natural beauty, wildlife, or recreation values of the area.

Where Applicable

In a woodland where a stand of trees is overstocked or where desirable trees are being crowded by less desirable trees, shrubs or vines; to improve future crop tree quality and maintain maximum growth rate; to maintain the natural beauty, wildlife, aesthetic, or hydrologic values of an area.

This practice should be applied only on sites of known, high potential for woods crop production. (Site - index of over 70).

Specifications

Remove or deaden the hollow, deformed, fire-scarred, mature, over-mature or undesirable trees, shrubs or vines. This may be accomplished by cutting, girdling, or use of chemicals. (Chemicals used in performing this practice must be federally and locally registered and must by applied strictly in accordance with authorized registered uses, directions on the label, and other federal or state policies and requirements.)

This practice also includes the removal or treatment of low-value species to favor high quality trees. Commercial use and local demand will govern what species are considered of low value and/or weed trees.

In locating T.S.I. plots, a 40-foot strip of woodland adjacent to open fields, highways, or open water areas should not be treated for woods improvement. This strip will provide wind protection for the rest of

the woodland; serve as an excellent food and cover site for wildlife, and contribute to the beauty of the community. Plants such as dogwood, redbud, viburnums, black gum, sugar maple, serviceberry, sassafras, sumac, virginia creeper, bittersweet, etc., should be encouraged in the woods border area.

The cutting or killing of vines should be accomplished where vines are interfering with growth of trees having commercial value. Some vines have high wildlife value and should not be removed from dead, cull trees, and ones being chemically killed.

This practice may also include the removal of heavy shrub cover in present woodland openings or in openings created by harvest cutting, when the shrubs seriously compete with desirable reproduction. This involves species such as hawthorne, spice bush, paw-paw, prickly ash, hercules club, etc.

Caution:

If herbicides are handled or applied improperly or if unused portions are not disposed of safely, they may be injurious to humans, domestic animals, desirable plants, fish, or other wildlife, and they may contaminate nearby crops, and other vegetation. Follow directions and heed all precautions listed on the container label.

Cost-Sharing

Cost-sharing will be 80 percent of the average cost of $20.00 per acre when performed according to the above specifications and according to the recommendation of the Service Forester, Division of Forestry, Indiana Department of Natural Resources.

Unit Price = $20.00 per acre
Maximum Cost-Share Rate = $16.00 per acre

Practice is eligible for cost-share when all recommended T.S.I. work is completed.

660 WOODLAND PRUNING (Acres)

Definition

Removing all or parts of selected branches from trees.

Purpose

To improve the quality of the wood product or the appearance of trees.

Where Applicable

On lands growing trees where the quality of the final product and the potential of the site justify the cost.

Specifications

A. Pruning to improve quality of butt logs.

1. Species

   a. Black walnut, white pine, and red pine should be pruned when grown in natural stands of plantations.

   b. Tulip poplar, shortleaf, and loblolly pine in fully stocked stands do a good job of natural pruning, and should not be recommended for this practice.

   c. Pole-size quality hardwoods may be approved for pruning by the Service Forester.

2. Tree Pruning

   a. Do not prune all trees. Select straightest and tallest crop trees with 3 to 7 inches D.B.H.

   b. At first pruning, remove branches from the lower 1/2 of the tree.

   c. After initial pruning, do not remove over 1/3 of live crown in any subsequent operation. Continue at 2 to 3 year intervals until 17 foot of clear length has been pruned.

1/ Hardwoods are recommended for undisturbed sites in woodland openings or for wide-spaced plantings in old fields where weed control can be accomplished.

2/ Fence post production only.

3/ For Christmas tree production only.

Cost-Sharing

Cost-share, when planned and established according to the above specifications, will be 80% of the actual cost involved not to exceed 80% of the estimated cost.

Where production from livestock is needed, fencing as planned and installed will be cost-shared in accordance with practice 472, Livestock Exclusion.

Plantings of over 1200 trees will be referred to the Service Forester, Division of Forestry, Indiana Department of Natural Resources for technical assistance. All hardwood tree planting request will be referred to the Service Forester.

Unit Price = $80.00 per acre
Maximum Cost-Share Rate = $64.00 per acre

Practice is eligible for payment when trees are planted, and protected if necessary.

644 WILDLIFE WETLAND HABITAT MANAGEMENT (Acres)

Definition

Retaining, creating, or managing wetland habitat for wildlife.

Purpose

To preserve, create, or improve habitat for waterfowl, furbearers or other wildlife.

Where Applicable

On existing wetlands and on lands where water can be impounded or regulated by diking, ditching, or flooding.

Specifications

Furbearers

1. Impoundments with water control structures.

   a. Construct a water control structure that will permit water levels to be controlled from 12-36 inches.

   b. Maintain water level at about 12 inches during the growing season to encourage the growth of cattails, bulrush, sedges, bur reed, arrowhead, and other aquatic plants useful as muskrat food.

   c. Gradually raise water level to maximum depths, starting September 1 to make these food plants available to furbearers and prevent winter freeze out.

   d. For types and sizes of structures required use applicable service specifications. Stop-log type of structures are recommended.

2. Impoundments without water control structures.

   Construct an earth fill dam without a mechanical spillway. These are less affective than the structures described above. On such areas at freezeup time a depth of 36 inches shall cover at least 20 percent of the area. Additional shallow pits may be constructed in the

groups of nozzles which spray intermittently is controlled by solenoid valves. The valves are activated by a system of relays and switches and are powered by an automobile battery. The intensity and energy of the simulated rain may be varied by changing the portion of the time the nozzles are spraying or the size of nozzle used. The present design applies intensities of approximately 2½ or 5 inches per hour at approximately 80 percent of the kinetic energy of intense natural rainfall. Accurate reproducibility of simulated storms is possible. Moderate wind velocities do not seriously affect rainulator characteristics.

The rainulator was designed in units so that the number and length of plots covered simultaneously could be varied. Plots which are most commonly used are 10 or 12 feet wide by 35 or 75 feet long with borders between plots which are 6 to 8 feet wide. A small irrigation pump supplies water through portable aluminum pipe to the rainulator with a pressure of 40 psi at the flow rate required.

The rainulator does not embody the mechanical simplicity which was initially anticipated for it. Necessarily, some relatively complex components were used rather than sacrifice desired characteristics. Also, intermittent spraying of the nozzles was necessary in preference to much lower rates of kinetic energy or much greater application intensities. Close observation of this intermittency of application has not indicated undesirable effects.

All rainulator components were designed for rapid assembly and ease of transportation. Weight and corrosion were minimized by using aluminum wherever possible. Associated equipment is also completely portable and readily assembled.

Operation

During a rainulator study, each plot is subjected to a series of simulated storms, or runs. These are applied at desired periods and are of selected duration corresponding to storms with high recurrence intervals. The series of runs most commonly used are a 60 minute "dry" run at the existing moisture condition, a 30 minute "wet" run approximately 24 hours later, and a 30 minute "very wet" run beginning 15 minutes after the end of the wet run. The intensity of 2½ inches per hour is used throughout the three runs. This series of runs covers a wide range of moisture conditions, is efficient to apply, and can be accurately reproduced on other treatments or studies. Based on existing information, combinations of intensities offer no known important advantage for most studies.

The water applied during rainulator runs is determined by samples from small aluminum channels placed diagonally across each plot. Runoff is recorded by a water level recorder on a small calibrated flume. The soil content of the runoff is determined from samples of the runoff which are periodically collected by a sampling slot on a small rotating wheel. Photographs of each plot are taken prior to each study and at other appropriate times for later reference concerning conditions not noted at the time of the runs.

For treatments involving row crops, the rows are planted parallel to the slope during the year of study. If rows were planted across the slope of the relatively narrow plots instead, each row would act as a dam and would pond a large amount of the potential runoff. The portion of water and sediment retained plus the manner in which breakovers of the ponded occurred could influence the results more than the treatments involved. Rows which are up and down the slope prevent major ponding, and treatment differences are more precisely measured. Furthermore, treatments applied parallel to the slope are the basic condition to which other conditions are compared for current erosion prediction methods, and the treatments can be applied and maintained more easily.

Many rainulator studies are conducted on farm fields which fulfill the soil, crop, management, and topographic requirements of the experiment. Plots which were established for yield or other types of comparisons but which are also suitable for rainulator use are sometimes available. In such cases, much of the time and expense of operating plots for a sufficient period to attain the required study condition is saved.

Rainulator studies can be replicated on soil conditions which vary widely both physically and geographically and therefore are not limited to conditions available at field research stations. Where treatments are compared at different geographical locations, identical rainulator storms are reproduced at each location and confounding of the treatments with the storm patterns of natural rainfall is eliminated.

The twelve rainulator units which are presently in use in Indiana will cover three plots which are each 75 feet long or six plots which are 35 feet long. The shorter length reduces the time and water required for each series of runs. Use of the shorter plots also permits the study of six plots within a few hours. Such use is particularly advantageous for comparison of up to 6 treatments. For this procedure, units are assembled to cover all treatments of one replication, rainulator runs are made on three plots simultaneously, a few rainulator components are moved, and runs are made on the remaining plots. This procedure is repeated for the other replications. With plots longer than 35 feet, more than three treatments may be compared during the same day with the present equipment.

A crew of four persons is required for most efficient operation of the rainulator.

Although complete infiltration data is obtained during rainulator runs, the recognition that the rainulator was designed primarily to study erosion and not infiltration is very important. When the study of infiltration is the only objective, other devices are available which will produce results of comparable accuracy with less effort. However, such devices are not well suited for accurate erosion research. Erosion studies require the application of high energy water drops to a sufficient length of slope so that enough flowing water accumulates to readily transport erodible soil particles. The rainulator was designed for such applications.

Research Results

Each series of rainulator runs produces a large amount of data. The collected data is analyzed during the period of the year when rainulator runs cannot be conducted. The results are used to determine primarily the rates and amounts of soil loss, infiltration, and runoff during each run. Various other characteristics can also be studied.

Certain types of studies are better suited than others for rainulator research. Studies of residue management, relative erodiability of soil types, methods of tillage, crop sequences, and rainstorm energy and intensity effects can be studied effectively. Other studies such as those involving freezing temperatures or tall crops are less suited due to simulator or treatment characteristics.

Numerous studies have been conducted using simulated storms applied by the rainulator, and important research information has been obtained. Brief summaries of some of the investigations follow.

A detailed study of the various methods of minimum tillage (plow-plant with and without smoothing and plow, wheel-track plant), as compared to conventional tillage (5) was initiated in 1959. Results from runs during the initial year indicated that minimum tillage for corn increased the amount of infiltration by 50 percent shortly after planting, by 20 percent after the first cultivation, and by 10 percent at harvest time. The minimum tillage treatments had higher infiltration rates throughout all runs. Minimum tillage also reduced the soil loss by 35 to 50 percent during each of the above periods. Soil losses at harvest were relatively minor as compared to losses at the earlier crop stages. Differences between the various minimum tillage treatments were not significant during the initial year. Cultivating the minimum tillage treatments twice as compared to no cultivation was also studied. The cultivations eliminated severe surface crusts, greatly increased the infiltration, and significantly reduced the soil loss. This study will be continued for a total of five successive years of corn.

In another study, erosion from cornstalks as left by a picker and from shredded cornstalks (1) were compared. The shredded stalks reduced erosion from the intense storms by 60 percent. Disking of the shredded stalks increased the amount of infiltration, but soil loss was greater than from the shredded-only treatment.

Other rainulator studies have indicated that (1) deep tillage is ineffective in reducing erosion when the channels are not kept open to the surface, (2) a small amount of surface mulch greatly decreases erosion, (3) the erodibility of some soils is affected more by management then by soil type, (4) the first year of corn in a rotation produces less eorsion then the second year of corn in the same rotation, (5) erosion from row crops following bromegrass is less than erosion from row crops following alfalfa for the first 2 or 3 years, and (6) benefits from previous meadow crops are insignificant after 2 or 3 years of row crops. More detailed information will be obtained from further study of these and other characteristics.

Efficient utilization of the rainulator necessitates runs at selected periods instead of throughout the period of rainfall erosion. Rainulator results will be of additional value if they can be used directly in an universal soil-loss prediction equation (8). Therefore, methods by which rainulator results can be related to natural rainfall patterns and long-term runoff plot studies are being investigated. Use of the respective erosion indices (6) and the relative losses by cropping periods (7) show the most promise. Results from studies of inherent factors such as soil erodibility and land slope are expected to be more easily adapted for direct use in a prediction equation.

In addition to the original rainulator in Indiana, rainulators are now in operation at Agricultural Research Service Stations in Georgia and Minnesota and are in various stages of progress at other locations. The simulated rainfall approach to runoff and erosion investigations promises to provide a wealth of information concerning the soil and water conservation merits of many land use conditions. The results are also obtained in a much shorter time period than those dependent upon natural rainfall.

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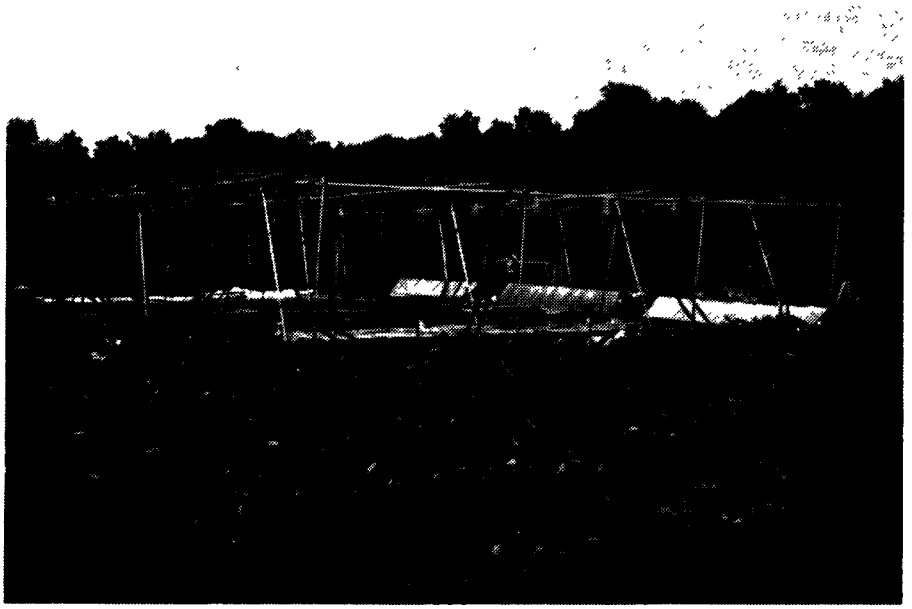
Summary

The rainulator is a research tool which produces simulated rainfall for erosion studies on rectangular plots. Numerous characteristics which are desirable for runoff plot research were included in the design of the rainulator and its associated equipment. Studies consist of a series of successive storms on various treatments. The results supplement those obtained from natural rainfall studies and are obtained more rapidly and efficiently.

Numerous studies have been conducted with the rainulator. In one study, minimum tillage for corn was found to significantly increase infiltration and reduce soil loss as compared to conventional tillage. In another, shredded cornstalks reduced erosion approximately 60 per cent as compared to stalks as left by the cornpicker. The soil and water conservation merits of various other soil, crop and tillage treatments have also been investigated. These investigations assist in relating the various factors which influence methods of conservation farm planning.



SIMULATED RAINFALL MAKER

"RAINULATOR"

NO PLOW TILLAGE SYSTEMS FOR CORN

by
D. P. Griffith and J. V. Mannering
Agronomy Department

A few Indiana farmers have sold their moldboard plows and jumped to a radically new type of tillage-planting system. Many more farmers are taking a critical look at their adventurous neighbors and are seeking research results on the new systems.

There are several reasons why farmers are considering the new tillage systems. Several types of no-plow tillage-planting equipment have become commercially available in the last few years. Low grain prices have caused a more critical look at equipment and labor costs. Some of the new systems offer an opportunity to reduce these costs, but, in many cases, the savings are offset by increased chemical costs. Farmers who have serious wind or water erosion can definitely help their problem with some form of no-plow tillage.

Probably the greatest benefit from no-plow tillage comes from getting the crop planted in a shorter time. With acreage per farm getting larger and the proven yield advantage for early planting, timeliness becomes all important.

In 1967, Purdue started a research project which compares several no-plow tillage systems with conventional tillage. The experiments are located at Regional Research Stations in northern, east central and southern Indiana and involve 5 soil types. Some obvious advantages and problems have shown up in our 2 years' experience with the new systems.

Chisel Planting

Chisel plows are being used with several types of planting systems in the Midwest. Our system has included 2 fullwidth tillage operations, deep tillage in the fall with chisel points and shallow tillage at planting, replacing the points with wide sweeps.

This is an excellent system from the standpoint of water management and erosion control. The fall pass offers an opportunity to break-up plow soles, apply anhydrous ammonia, and partially incorporate residues and surface applied phosphorus and potassium.

Problems with the chisel system have included reduced stands when heavy soils were moist at planting and poor grass control with herbicides on the heavy soils. Cultivation is usually delayed until the corn is 10 to 12 inches high, due to the rough soil surface.

Rotary Tillage

Tilling an 8-inch strip to a depth of 4 inches has resulted in good stands of corn except when heavy rains followed planting on a silt soil.

Incorporating herbicide and insecticide in the 8-inch strip provides good pest control in the row. However, chemical weed control between the rows has sometimes been poor. Some farmers use the rotary machine for full-width tillage, but this increases power requirements and erosion hazards. Volunteer corn and cumbersome turning when pulling a planter are problems in some fields.

Wide-Strip Tillage (Till-Plant System)

Planting in a pre-formed ridge with the till-plant system allows earlier planting then other no-plow systems. Soil in the ridge dries out and reaches germinating temperature ahead of non-plowed soils with a level surface profile. Our 1968 experiments show excellent stands for the till-plant system on all soils. Chemical weed control has been good with this system. Erosion control potential is excellent when ridges go across slopes.

We have noted some difficulty in keeping the disc hiller-type cultivator centered between rows when forming ridges. Other types of cultivators might be more successful when soils are cloddy.

Narrow-Strip Tillage or "No-Till" Planting

Use of the fluted coulter to till a 2.5 inch strip for each row allows early rapid planting with low power requirements. Per cent stand, plant growth, and weed control, however, have often been less satisfactory than with conventional tillage. Using a disc ahead of the "no-till" planter should help to incorporate residues and chemicals but may not solve the weed control problems. One hundred to 200 pounds of extra weight per row on the planter aids penetration of the coulters in dense soil and should improve stand.

This system, with residues left on the surface, cuts soil loss to a minimum, but may provide poor water intake due to the compacted surface on medium-textured soils.

Research at the Purdue Agronomy Farm at Lafayette has shown that corn root growth in the compact soil resulting from 6 years of "no-till" planting was severely reduced compared to corn roots with conventional tillage. The effects of the smaller root system on fertilizer and water uptake by the corn plants are now being studied.

General Comments

Few problems were encountered with all no-plow tillage systems on lighter soils such as sandy loams. On heavier soils, better management and some equipment adaptations may be necessary to control weeds, produce adequate stands and maintain yield potential.

Purdue research indicates that surface-applied phosphorus and potassium remained in the top two inches and potassium remained in the top two inches of soil after six years of no tillage. Such methods as chiseling, rotary tillage, ridging and discing offer some incorporating

to about four inches, but far less than deep plowing. This indicates that soils which are low in fertility should be built up to a medium or high soil test level before switching to shallow tillage.

Soil testing in non-plowed fields should separately represent tilled and untilled portions of the soil profile. Depletion of phosphorus or potassium in the major part of the root zone may indicate the need for periodic plowing.

In the long run, questions concerning insect and disease problems, fertilizer placement, and the effect of soil density on root development must be answered to properly evaluate the no-plow systems.

Section Ten

EXHIBITS

Allen County
Soil & Water Conservation District

Executive Park - Suite 103 · 2010 Inwood Drive · Fort Wayne, Indiana 46805
422-3373 or 422-6131, Ext. 160

COOPERATOR-DISTRICT AGREEMENT
BCS-1 BLACK CREEK SEDIMENT STUDY PROJECT

I desire to cooperate with the Allen County Soil & Water Conservation Distri in achieving its soil and water conservation objectives in my community.

I further desire to become a cooperator in the District Black Creek Sediment Study Program. I therefore, request assistance that will help me in making land use and treatment decisions where needed and/or in applying and maintai ing conservation practices needed on my land.

I desire to develop a conservation plan on my land with assistance from the Soil Conservationist available from the district. This conservation plan will spell out the financial assistance that will be available to me for the installation of the practices until the end of the program period (October 1977).

The conservation plan will not constitute a contract between the cooperator and the district. This conservation plan does not require me to take part in the cost-sharing program nor does it obligate the district to furnish cost-sharing to the cooperator.

In order to receive cost-sharing on practices identified in the conservation plan further negotiations between the district and me will be needed to ente into a legal contract for cost-sharing.

I will grant district representatives the right to ingress and egress to my land during the period of this agreement, for the purpose of conducting surveys, and planning, installing and inspecting applied conservation practices.

I understand the help I receive will be dependent on the ability of the district to supply the services. These services include such items as soil survey maps and interpretations, and technical assistance for planning, applying and maintaining conservation practices.

Neither the District nor I will be liable for damages to the other except for those caused by negligence or misconduct.

This cooperative agreement will be for the initial period through October 1977 following signature by both parties and continue in effect until I or the district cancels by giving sixty (60) days notice in writing, or my connection with the property terminate.

FOR USE BY SWCD:

_____
Land Unit Number

_____
Total Acres

_____
Supervisors Approval

NAME OF OWNER		OR	NAME OF OPERATOR
ADDRESS			ADDRESS
PHONE	DATE	PHONE	DATE

Allen County
Soil & Water Conservation District

Executive Park - Suite 103 - 2010 Inwood Drive - Fort Wayne, Indiana 46805
422-3373 or 422-6131, Ext. 160

GROUP
COOPERATOR DISTRICT AGREEMENT
BCS-1a BLACK CREEK SEDIMENT STUDY PROJECT

We desire to cooperate with the Allen County Soil and Water Conservation District in achieving its soil and water conservation objectives in our communit

Our group desires to become a cooperator in the District Black Creek Sediment Study Program and, requests assistance that will help in making land use and treatment decisions where needed and/or in applying and maintaining conservation practices needed on our lands.

We desire to develop a conservation plan on our land with assistance from the Soil Conservationist available from the district. This conservation plan wil spell out the conservation practices needed on our land and will be a guide to the amount of financial assistance that will be available to our group for the installation of the practices until the end of the program period (October 1977).

The conservation plan will not constitute a contract between the group and the district. This conservation plan does not require the group to take part in the cost-sharing program nor does it obligate the district to furnish cost-sharing to the group.

In order to receive cost-sharing on practices identified in the conservation plan further negotiations between the District and the group will be needed to enter into a legal contract for cost-sharing.

We will grant district representatives the right to ingress and egrees to our land during the period of this agreement, for the purpose of conducting surveys, and planning, installing and inspecting applied conservation practices

We understand that the help received will be dependent on the ability of the district to supply the services. These services include such items as soil survey maps and interceptions, and technical assistance for planning, applyi and maintaining conservation practices.

Neither the district nor the group will be liable for damages to the other except for those caused by negligence or misconduct.

This cooperative agreement will be for the initial period through October 1977 following signature by both parties and continue in effect until the group or the district cancels by giving sixty (60) days notice in writing, or my connection with the property terminate.

****

TOWNSHIP	SECTION	TOTAL ACRES
SUPERVISOR	TITLE	DATE

BCS-2 PLAN OF OPERATIONS Black Creek Study Area

TOWNSHIP	SECTION	CONTRACT NUMBER
COOPERATOR	ADDRESS	PHONE NUMBER
SITE OR CAPABILITY INFORMATION	OPERATING UNIT NUMBER	TOTAL ACRES
LAND USE	FIELD NUMBER(S)	ACRES

CONTRACT ITEM NUMBER	FIELD(S)	PLANNED TREATMENT Record of Cooperator's Decisions	AMOUNT OR EXTENT	UNIT COST	COST SHARE RATE	TIME SCHEDULE AND ESTIMATED COST-SHARE BY YEARS (for non-cost share items show n/c)					VOUCHER REFERENCE
						1973	1974	1975	1976	1977	

NAME	CONTRACT NUMBER	OPERATING UNIT NUMBER

CONTRACT ITEM NUMBER	FIELD (s)	PLANNED TREATMENT Record of Cooperators Decisions	AMOUNT OR EXTENT	UNIT COST	COST SHARE UNIT	TIME SCHEDULE AND ESTIMATED COST-SHARE BY YEARS (for non-cost share items show n/c)					VOUCHER REFERENCE
						1973	1974	1975	1976	1977	

Approved By:

Cooperator _____

_____

Date: _____

Technical Approval:

_____ _____
district conservationist date

Certification of Funds:

_____ _____
contracting officer date

BCS-3

BLACK CREEK SEDIMENT STUDY PROJECT

CONTRACT

Part I - Cooperator

Name _____ _____

Address _____

Contract No. _____
Township _____
Section _____

Contract period from _____ to _____

Operating Unit Number _____

****

Part II - Terms and Conditions

The undersigned and above-named cooperators hereby agrees to participate in the Black Creek Sediment Study Project and fully understands that his participation herein is subject to all the provisions of this contract. He hereby agrees to carry out, on the operating unit described in Part I, hereof, land use adjustments, conservation cropping systems, and conservation measures in conforming with and as shown on the attached plan of operations. The said plan of operations is hereby made a part of this contract and is subject to annual review and modifications subject to approval of all concerned parties. The cooperator agrees to follow the said plan of operations according to its time schedule of land use and treatment and in accordance with the specifications and regulations obtained from the local Soil Conservation Service office and the Black Creek Handbook. The cooperator hereby certifies that he has control of this operating unit during the period of this contract shown herein.

****

Part III - Cooperators Signature

Date _____

Signature _____

****

Part IV - Approval

Date _____ By _____
Contracting Officer

Date _____ By _____
Project Administration Officer

BCS-4
Black Creek Study Area
Allen Co. SWCD

MODIFICATION (OR WAIVER) OF CONTRACT

Township	Section	Contract Number	Modification Number

Cooperator

The Following Modifications (or waivers) are Made in the Contract:

Page Number: of

Field	Contract Item Number	Planned Treatment (Record of Producers Decisions)	Pre. Est. Cost Share	Re. Amount Extent Est.	Re. Ave. Cost$	Rate Cost Share %	Revised Time Schedule & Est. GP Cost-Share by Yr For N/C Share Show Units 1974	1975	1976	1977	Notes

Basis for Modifications (or waivers):

For Non-Cost Share Items Show N/C

Approved By:

Cooperator _____

_____ _____
Date

_____

Technical Approval: Date:

District Conservationist _____ _____

Contracting Officer _____ _____

Action Approved:

Project Administrator _____ _____

S-5
ack Creek Study Area
len County SWCD

APPLICATION FOR PAYMENT FOR COST-SHARE UNDER THE BLACK CREEK STUDY PROGRAM

Township_____
Section_____
Contract No._____

I (we) certify that the following information is true and correct and that the identifiable unit for which cost share is requested was carried out and performed in accordance with the specifications and provisions of the above numbered contract; as required under the Black Creek Study Program.

Specified Conservation Practices Performed

(a) Line	(b) Constr Item No.	(c) Practice and Identifiable Unit	(d) Date: Begun	(d) Date: Complete	(e) Extent	(f) Average Cost--$	(g) Cost Share Rate	(h) Amount Earned
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								

TOTAL AMOUNT EARNED: $_____

And I (we) have completed form SBA-363 listing in-kind contributions for the above work.

COOPERATOR'S NAME_____

SIGNATURE_____ DATE_____
ADDRESS_____

I certify that the identifiable unit specified in the above application has been properly carried out, meets the standards of the Black Creek Study Program specifications and that the Cooperator is in compliance with provisions of the above numbered contract.

Date_____ District Conservationist_____

Date_____ Contracting Officer_____

TRANSFER AGREEMENT
BLACK CREEK STUDY

BCS-6
Black Creek Study Area
Allen County SWCD

Township_____
Section_____
Contract No._____

PRESENT COOPERATOR(S) NAME AND ADDRESS	NEW COOPERATOR(S)-NAME AND ADDRESS
(signature)	(signature)

The undersigned present cooperator and the new cooperator hereby certify that the present cooperator has transferred to the new cooperator the following right and interest in the operating unit described in the above-numbered Black Creek Study Program contract:

All Rights and Interest Transferred

Contract items to be carried out by the new Cooperator

****

Now, by virtue of this transfer and the request of the new Cooperator that he be substituted under the above-mentioned contract for the present cooperator with respect to the right and interest transferred. It is agreed:

1. The new cooperator hereby agrees to be bound by all the terms and conditions of that contract with respect to the right and interest transferred.
2. The new cooperator agrees that his rights to cost shares or other assistance under the above, mentioned contract with respect to the right and interest transferred shall be the same as the rights of the present cooperator would have been if the transfer herein mentioned had not taken place.
3. The SWCD agrees to pay such cost shares or give such other assistance as may not be due or may hereafter become due to the new cooperator or the present cooperator under the above-mentioned contract and this transfer agreement on the basis of and subject to the terms and conditions of the above-mentioned contract and this transfer agreement, and the rules and regulations applicable to the Black Creek Study Project.

Approved:

Contracting Officer:_____ Date:_____

BCS-7
Black Creek Study Area
Allen Co. SWCD

Township_____
Section_____
Contract No._____

AGREEMENT COVERING NON-COMPLIANCE WITH PROVISIONS OF CONTRACT

Cooperator	Address

1. DETAILS OF NON-COMPLIANCE:

2. NATURE AND EFFECT OF NON-COMPLIANCE WITH PROVISIONS OF CONTRACT (CHECK APPLICABLE BLOCK)

   a. warrents termination of the contract-contract terminated

   b. does not warrent termination of the contract-contract not terminated

3. FORFEITURE, REFUND OR PAYMENT ADJUSTMENT (SET OUT FOR COOPERATOR NAMED AT TOP OF PAGE).

4. ACCEPTANCE OF COOPERATOR

The undersigned hereby agrees that, under the above identified, Black Creek Study Program contract, his forfeiture or refund or payment adjustment shown in paragraph 3 above is proper and any amounts in connection therewith, as indicated in paragraph 3 above are due and owing by him. The undersigned also agrees to the nature and effect of non-compliance with provisions of the contract as set out in paragraph 2 of this form and waives the right to any further proceeding under the regulations governing contract violations.

signature	date

5. APPROVAL

contracting officer	date	chairman SWCD	date

NOTICE OF CONTRACT VIOLATION
Black Creek Study Program

BCS-8
Black Creek Study Area
Allen County SWCD

Township_____
Section_____
Contract No._____

Name of Cooperator	Address of Cooperator

You are hereby notified that information has been received which indicates a violation of the above-identified Black Creek Study Program contract as follows:

You may obtain a hearing before a hearing officer by the Chairman of the Allen SWCD respect to such violation if you file a written request for such a hearing in the office of the Allen County SWCD,

(Address)	(City)	(State)

not later than 30 days after you receive this notice. If you request such a hearing, the hearing officer will notify you in writing of the time, date and place set for the hearing. You may be represented at such a hearing and will be given a full opportunity to present facts and information relevant to the alleged violation, including oral or documentary evidence. If you fail to request a hearing within the time specified above, you will have no further right to a hearing officer.

Request for information concerning this notice or the alleged violation should be referred to the above mentioned SWCD office.

DATE:_____

_____
(Contracting Officer)

ANNUAL CONTRACT STATUS REPORT
BLACK CREEK STUDY

BCS-9
Black Creek Study Area
Allen County SWCD

Township_____
Section_____
Contract No._____

Name of Cooperator(s):

_____ of _____

_____ of _____

1. Program in carrying out contract:

2. Waivers or modifications needed in contract:

Date_____ _____
(Designated SCS Technician)

BCS-10
Black Creek Study Area
Allen Co. SWCD

NOTICE OF CONTRACT TERMINATION
BLACK CREEK STUDY

_____ Township _____
NAME

_____ Section _____
ADDRESS

_____ Contract No. _____
OPERATING UNIT NUMBER

****

You are hereby notified that in accordance with the regulations set forth in the Black Creek Study Program Handbook that, contract number _____ is terminated, effective _____.

The reason for termination is: _____

_____

_____

_____

_____.

A refund of cost-share payments made under the terms of the contract is required. You will be informed of the amount of the refund and how it is to be made by the Allen County Soil & Water Conservation District, Executive Park - Suite 103, 2010 Inwood Drive, Fort Wayne, IN 46805.

_____ _____
DATE PROJECT ADMINISTRATOR

CONTRACT CHECK SHEET

NAME OF COOPERATORS:	C.O.	D.C.
ITEMS REVIEWED		
A. APPLICATION 1. Cooperator is eligible and has control of the operating unit for the required contract period.		
2. Land is eligible and qualified as an operating unit.		
3. Has all or any part of operating unit been under a previous BCS contract.		
4. Priority for participation shown on BCS-1.		
B. PLAN OF OPERATIONS/TIME SCHEDULE OF LAND USE AND TREATMENT 1. All fields and acreage accounted for.		
2. Planned treatment is compatible with technical guides.		
3. Plan contains all essential practices scheduled in proper sequence and agrees with the conservation plan map.		
4. Contracting Officer certifies that the plan meets objectives of the program.		
5. SWCD Board has been given opportunity to review.		
C. CONTRACT 1. Conservation plan map included, and shows field numbers, acreage and land use.		
2. Soil and land capability maps and legends included as applicable.		
3. Practices, identifiable units, cost-share rates, average costs, and specified maximum costs are in accordance with current approved lists of practices, cost-share rates, and costs.		
4. Period of contract is within the applicable limitation.		
5. Total cost-share obligations are within limitations as allowed in the BCS Handbook.		
6. Contract item numbers assigned for all practices and identifiable units.		
7. Cooperator has signed form BCS-3 and has authority to sign.		

REMARKS

Date Checked and Initials of D.C.

Date Checked and Initials of C.O.

Prescribed by State Board of Accounts BCS-12 General Form No. 363 (19'

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

155

For period beginning _____, 19____ and ending _____, 19____

To: _____ Project No. _____
(State or Federal Agency)

From: _____ Project Title _____
(Contributing Agency)

_____ _____
(Governmental Unit)

_____ County Public Law No. _____ (If Applicabl

This report must be itemized to show: Kind of service, dates when rendered, by whom, rate per day, number of hours, rate hour, price per foot, per pound, per hundred, etc.

Date 19____	By Whom Rendered	Kind of Service and Itemization	Amount

I hereby certify that the foregoing account is just and correct, that the items and amounts reported v used specifically for the above described project and that no part of same was used in, or reported as in-l matching contributions to, any other project.

_____ _____
(Signature) (Title)

BCS-13

BLACK CREEK SEDIMENT STUDY PROJECT

CERTIFICATION FORM

I _____ DO HEREBY CERTIFY THAT I HAVE CARRIED OUT THE PRACTICE OF _____ IN THE AMOUNT OF $_____ ACCORDING TO THE STANDARDS AND SPECIFICATION IN MY CONSERVATION PLAN AND ACCORDING TO THE PROVISION OF THE CONTRACT BETWEEN MYSELF AND THE ALLEN COUNTY SOIL & WATER CONSERVATION DISTRICT.

_____ _____

SIGNATURE DATE

BCS-14

AGREEMENT

I _____ do hereby agree to pay

_____ the sum of $ _____

which is the amount he bid for the construction of _____

_____

I will make payment as follows: _____

_____

and subject to technical approval of completion of the

Soil Conservation Service personnel.

_____ _____

signature of owner date

I _____

construct the above item(s) for

ability and accordi

landowner.

_____ _____

signature of contractor date